US FISH AND WILDLIFE SERVICE

PRELIMINARY
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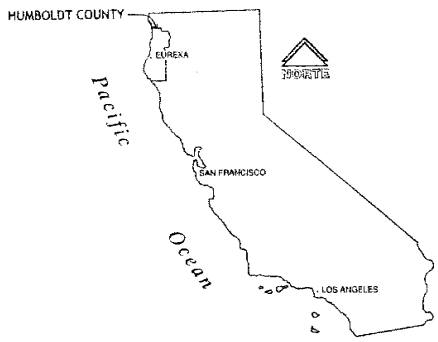
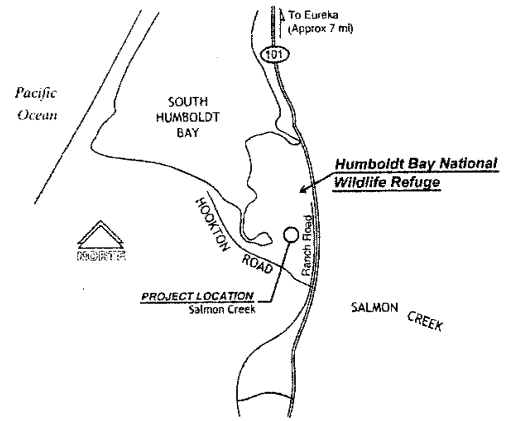
PRELIMINARY PLANS FOR CONSTRUCTION OF

SALMON CREEK PHASE 2
HABITAT ENHANCEMENT PROJECT





LOCATION MAP
NOT TO SCALE

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
(HBNWR)
January, 2010
90% Submittal

Prepared For:

- **Pacific Coast Fish, Wildlife and Wetlands Restoration Association (PCFWWRA)**
- **US Fish and Wildlife Service (USFWS)**
- **California Department of Fish and Game Grant Agreement No. P0710550**

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4	CONSTRUCTION ACCESS ROAD PLAN
5	GENERAL NOTES AND SEQUENCE OF CONSTRUCTION
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30	LOG STEPS DETAILED PROFILE
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Salmon Creek Phase 2
Habitat Enhancement Project

TITLE SHEET

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 1 of 31

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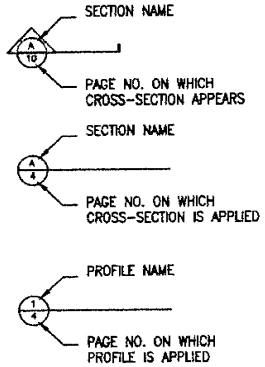
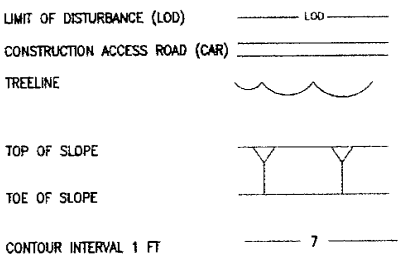
STANDARD ABBREVIATIONS

APPROX	APPROXIMATELY
CL	CENTERLINE
CAR	CONSTRUCTION ACCESS ROAD
CONC	CONCRETE
DIA	DIAMETER
(E)	EXISTING
ELEV	ELEVATION
FT	FEET
FL	FLOW LINE
(X:1)	HORIZONTAL : VERTICAL
IN	INCHES
EG	EXISTING GROUND
FG	FINISHED GRADE
LOD	LIMIT OF DISTURBANCE
MAX	MAXIMUM
MIN	MINIMUM
(N)	NEW
NTS	NOT TO SCALE
O.C.	ON CENTER
STA	STATION
TYP	TYPICAL
TBD	TO BE DETERMINED
W/	WITH

DRAWING SYMBOLS



LEGEND



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Salmon Creek Phase 2
Habitat Enhancement Project

ABBREVIATIONS AND LEGEND

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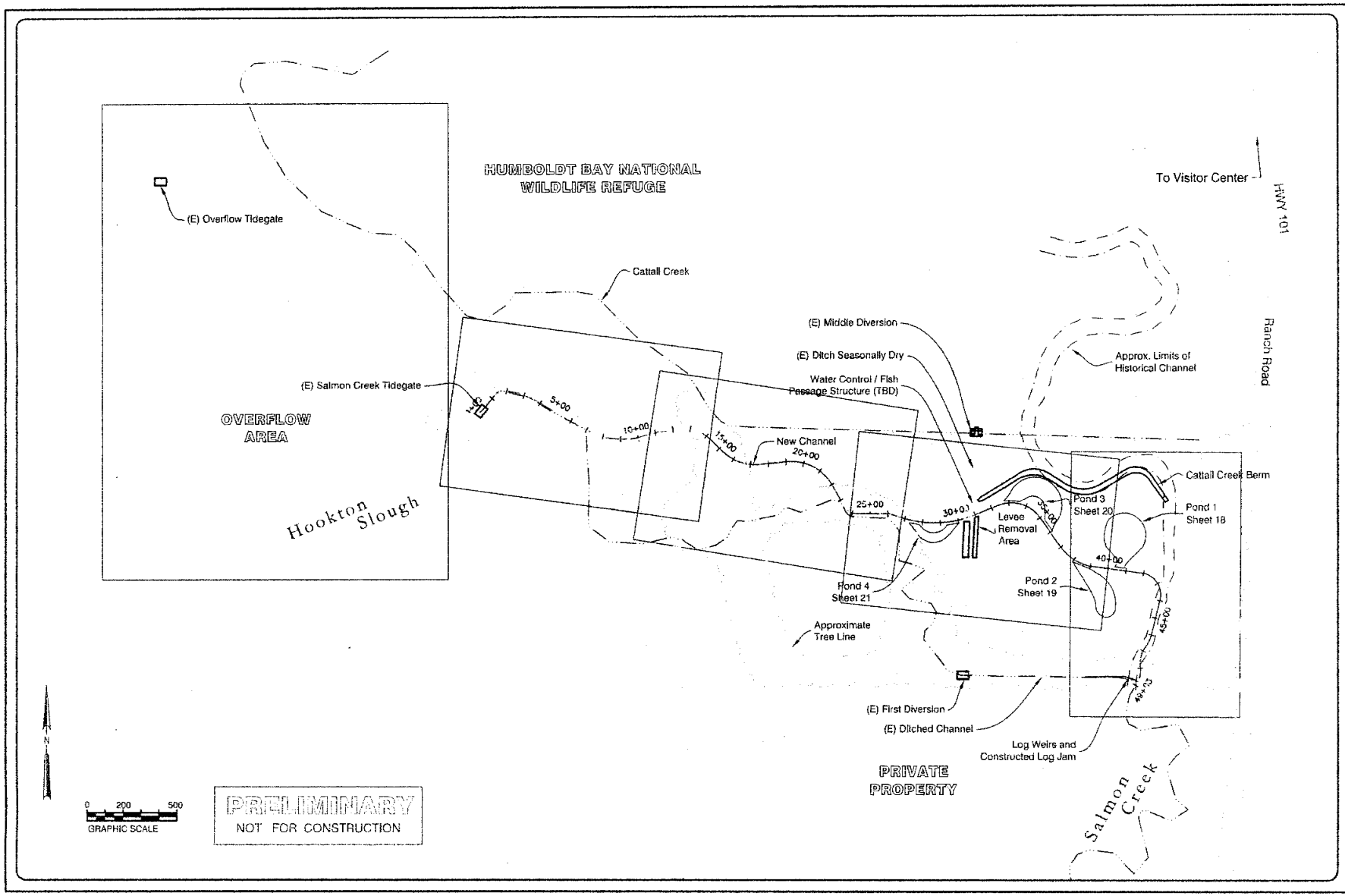
SHEET: 2 of 31



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HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

SITE OVERVIEW PLAN

DATE
Jan. 2010
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DESIGN
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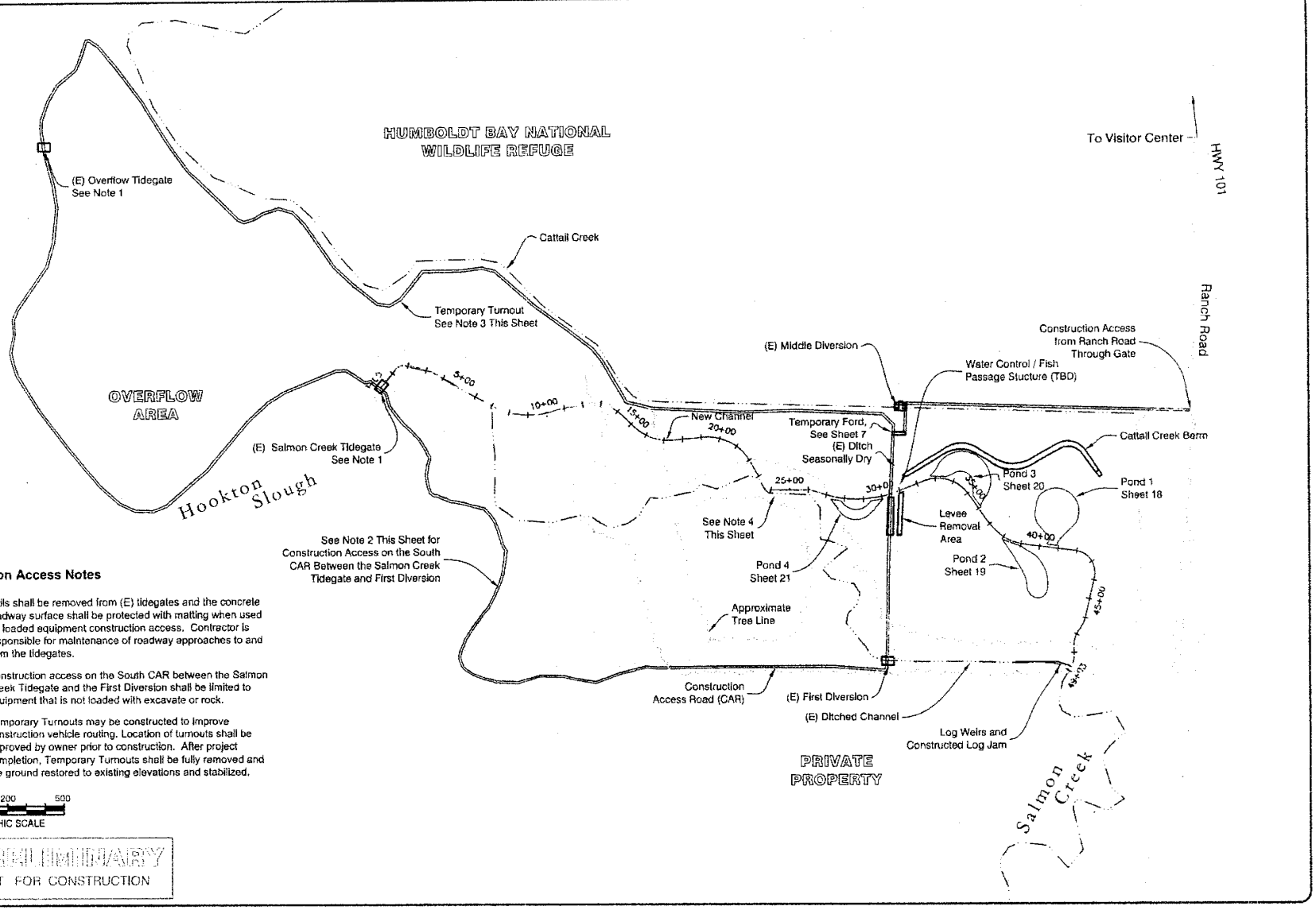
DRAWN
Llanos
SHEET
3 of 31



Construction Access Notes

1. Rails shall be removed from (E) tidegates and the concrete roadway surface shall be protected with matting when used for loaded equipment construction access. Contractor is responsible for maintenance of roadway approaches to and from the tidegates.
2. Construction access on the South CAR between the Salmon Creek Tidegate and the First Diversion shall be limited to equipment that is not loaded with excavate or rock.
3. Temporary Turnouts may be constructed to improve construction vehicle routing. Location of turnouts shall be approved by owner prior to construction. After project completion, Temporary Turnouts shall be fully removed and the ground restored to existing elevations and stabilized.

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HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

CONSTRUCTION ACCESS ROAD PLAN

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 4 of 31

General Notes

1. In the event cultural resources (i.e., historical, archaeological, and paleontological resources, and human remains) are discovered during grading or other construction activities, work shall be halted within a 100 foot radius of the find. The Northwest Information Center shall be notified at (707) 664-0880 by the owner. A qualified archeologist retained by the owner shall be consulted for an on-site evaluation. Additional mitigation may be required, at owners expense, by the county per the archeologist's recommendations. If human burials or human remains are encountered, the contractor shall also notify the county coroner.
2. If hazardous materials or what appear to be hazardous materials are encountered, stop work in the affected area immediately and contact 911 or the appropriate agency for further instruction.
3. All work shall comply with State of California Department of Transportation May 2006 Standard Plans & Specifications (Caltrans 2006) and the contract documents unless noted otherwise.
4. Contractor is responsible for complying with all project permits. Owner is responsible for obtaining and providing copies of all necessary project permits.
5. All utilities shown (if any) were located from above ground visual structures. No utility research was conducted for this site. Notify Underground Service Alert prior to any grading or excavation within the site at 1-800-227-2600.
6. The term "Owner" is defined as an authorized representative of the U.S. Fish and Wildlife Service or a designated representative. All improvements shall be accomplished under the approval, inspection and to the satisfaction of the Owner.
7. Placed materials not conforming to specifications shall be removed and replaced as directed by the Owner at no additional cost to the Owner.
8. The contractor, before submitting a bid for this project, shall visit the construction site and thoroughly familiarize themselves with all existing conditions above and below ground. Before submitting a bid, Bidders shall be satisfied as to the accuracy and completeness of these Specifications and Construction Documents regarding the nature and extent of all work described.
9. The contractor shall immediately notify the Owner upon discovering significant discrepancies, errors or omissions in the plans. Prior to proceeding, the Owner shall have the plans revised to clarify identified discrepancies, errors or omissions.
10. Traffic control shall conform to Caltrans, 2006, MUTCD, and of the MUTCD California Supplement. A traffic control plan shall be submitted to the Owner for approval prior to contractor mobilization.
11. Site topography survey conducted by Spencer Engineering in 2000 and Graham Matthews and Associates in 2002. Vertical Datum is NAVD88 and Horizontal Datum is CA State Plane Zone 1 in feet (NAD83).
12. Contractor shall maintain a clean and orderly work site. Because the work is on a National Wildlife Refuge, specific attention will be paid on a daily basis by the Owner to ensure that no litter will be left on the work site. Items include cigarette butts, food wrappers, food peels, construction debris etc. shall be disposed of in suitable receptacles provided by the contractor.
13. Contractor shall be responsible for providing their own water and power for operations, irrigation and dust control. At no time shall water be pumped from the creek.

Clearing and Grubbing Notes

1. Clearing and Grubbing shall be in accordance with Caltrans, 2006 Section 16.
2. Grubbing shall only occur within the limits of grading.
3. The limit of disturbance does not denote the limit of clearing and grubbing. The extent of clearing shall be minimized to the extent possible to allow maneuverability of equipment.
4. Non-salvageable material shall be chipped in locations specified by the Owner.

Sequence of Construction

Work phasing shall occur as follows:

Preconstruction

1. Owner will close adjustable opening in Salmon Creek and the Overflow Tidegates at a low tide in sufficient time before construction to allow the tidal portion of the project area to drain.
2. Owner will remove *Spartina* within the project area of the Overflow Area.
3. Owner will excavate up to five trenches within the Phase 6 work area and a geologist retained by the Owner will delineate the historical channel limits. Adjustments to the channel alignment may be made to the construction stakeout in this area.

Phase 1 (Stations to 7+00 to 23+00)

1. Install construction access, sediment control measures, turbidity curtains in overflow, and Temporary Dewatering Measures as needed.
2. Clear and grub.
3. Channel excavation shall be conducted in off-channel conditions by maintaining an earthen berm of native material between the newly constructed channel and the existing channel near Stations 7+00 and 23+00.
4. Construct channel and place excavated material in the Overflow Area or as directed by the Owner.
5. Install Filter Fabric Isolation near Station 7+00 to isolate work area from existing stream.
6. Coordinate with owner to remove fish from work area. Owner will supply certified biologist.
7. Remove earthen berms near Station 7+00 to connect new channel to existing channel.
8. Stabilize work area.
9. Remove Filter Fabric Isolation and Temporary Dewatering Measures, retaining earthen berm near Station 23+00.

Phase 2 (Stations 23+00 to 26+00)

1. Install construction access and sediment control measures.
2. Clear and grub.
3. Install Filter Fabric Isolation near Stations 23+00 and 26+00 to isolate work area from existing stream. Maintain streamflow along the toe of the south bank outside of work area. If streamflow cannot be isolated from work area:
   a. Install fish screens near Stations 23+00 and 26+00. Coordinate with owner to remove fish from work area. Owner will supply certified biologist.
   b. Install Earth Dike #1 near Station 26+00. Install Temporary Stream Diversion and Temporary Dewatering Measures and divert clear water into Phase 1 channel, see Detail A sheet 8.
4. Construct channel and place excavated material in the Overflow Area or as directed by Owner.
5. Remove earthen berm near Station 23+00.
6. Stabilize work area.
7. Remove Filter Fabric Isolation or Temporary Stream Diversion, Temporary Dewatering Measures, and fish screens, if installed.

Phase 3 (Stations 26+00 to 30+50)

1. Install construction access, sediment control measures, Temporary Dewatering Measures and Temporary Dewatering Measures as needed.
2. Clear and grub.
3. Construct channel and New Pond 4 and place excavated material in the Overflow Area or as directed by Owner. Channel excavation shall be conducted in off-channel conditions. Retain the western levee and construction access road near Station 30+50 and maintain an earthen berm of native material between the newly constructed channel and the existing channel near Station 26+00.
4. Install Filter Fabric Isolation near Station 26+00 to isolate work area from existing stream.
5. Coordinate with owner to remove fish from work area. Owner will supply certified biologist.
6. Remove earthen berm at Station 26+00 to connect new channel to existing channel.
7. Stabilize work area.
8. Remove Filter Fabric Isolation and Temporary Dewatering Measures.

Phase 4 (Water Control / Fish Passage Structure)

1. Install construction access, including Temporary Ford Crossing.
2. Install sediment control measures and Temporary Dewatering Measures as needed.
3. Clear and grub.
4. Construct Water Control/Fish Passage Structure in dry conditions.
5. Stabilize work area.
6. Remove Temporary Dewatering Measures, retaining Temporary Ford.

Phase 5 (Stations 30+50 to 42+75)

1. Install construction access, sediment control measures and Temporary Dewatering Measures as needed.
2. Clear and grub.
3. Construct channel, New Ponds 1-3, Rock Grade controls, wood features, and Cattail Creek Berm. Place excavated material in the Overflow Area or as directed by the Owner. Channel excavation shall be conducted in off-channel conditions.
4. Stabilize work area.
5. Remove Temporary Dewatering Measures, retaining Temporary Ford.

Phase 6 (Stations 42+75 to 49+00)

1. Install construction access, sediment control measures and Temporary Dewatering Measures as needed.
2. Clear and grub.
3. Construct channel, Rock Grade Controls and wood features. Channel excavation shall be conducted in off-channel conditions. Maintain earthen berm near Station 49+00. Install Temporary Sheet Pile Cofferdams #1 and #2 at the direction of the Owner if necessary to facilitate dewatering. Place excavated material in the Overflow Area or as directed by the Owner.
4. Install Filter Fabric Isolation to isolate earthen berm near Station 49+00 or Temporary Sheet Pile Cofferdam #1 (if installed) from the existing and Phase 6 channels.
5. Coordinate with owner to remove fish from work area. Owner will supply certified biologist.
6. RemoveTemporary Sheet Pile Cofferdam #1 and connect Phase 6 to existing channel, allowing streamflow to flow into Phase 6 channel and through the First Diversion.
7. Stabilize work area.
8. Remove Temporary Dewatering Measures, Temporary Sheet Piling #2 (if installed) Filter Fabric Isolation, fish screens and Temporary Ford.

Phase 7 (Log Step Pools and Constructed Log Jam)

1. Install fish screens and remove fish from the ditch channel between the First Diversion and Station 49+00.
2. Install construction access, sediment control measures, Temporary Earth Dike #2 and Temporary Dewatering Measures as needed.
3. Clear and grub.
4. Construct Log Step Pools, channel fill, and Constructed Log Jam from downstream to upstream.
5. Install Filter Fabric Diversion to isolate Temporary Earth Dike #2.
6. Coordinate with owner to remove fish from work area. Owner will supply certified biologist.
7. Remove Temporary Earth Dike #2
8. Stabilize work area.
9. Remove Temporary Stream Diversion and Temporary Dewatering Measures, including Temporary Earth Dike #2. Remove Fish screens.

Phase 8 (Stations 30+25 to 30+50)

1. Install construction access, sediment control measures, and Temporary Dewatering Measures as needed.
2. Clear and grub.
3. Install Filter Fabric Isolation near Stations 30+25 and 30+50 to isolate work area from existing stream.
4. Coordinate with owner to remove fish from work area. Owner will supply certified biologist.
5. Remove West Levee area connect Phase 3 and Phase 5 channels. Place excavated material in the Overflow Area or as directed by the Owner.
6. Stabilize work area.
7. Remove all Filter Fabric Isolation, Temporary Dewatering Measures, fish screens, and all remaining temporary construction access, and applicable sediment control measures and from the project area.

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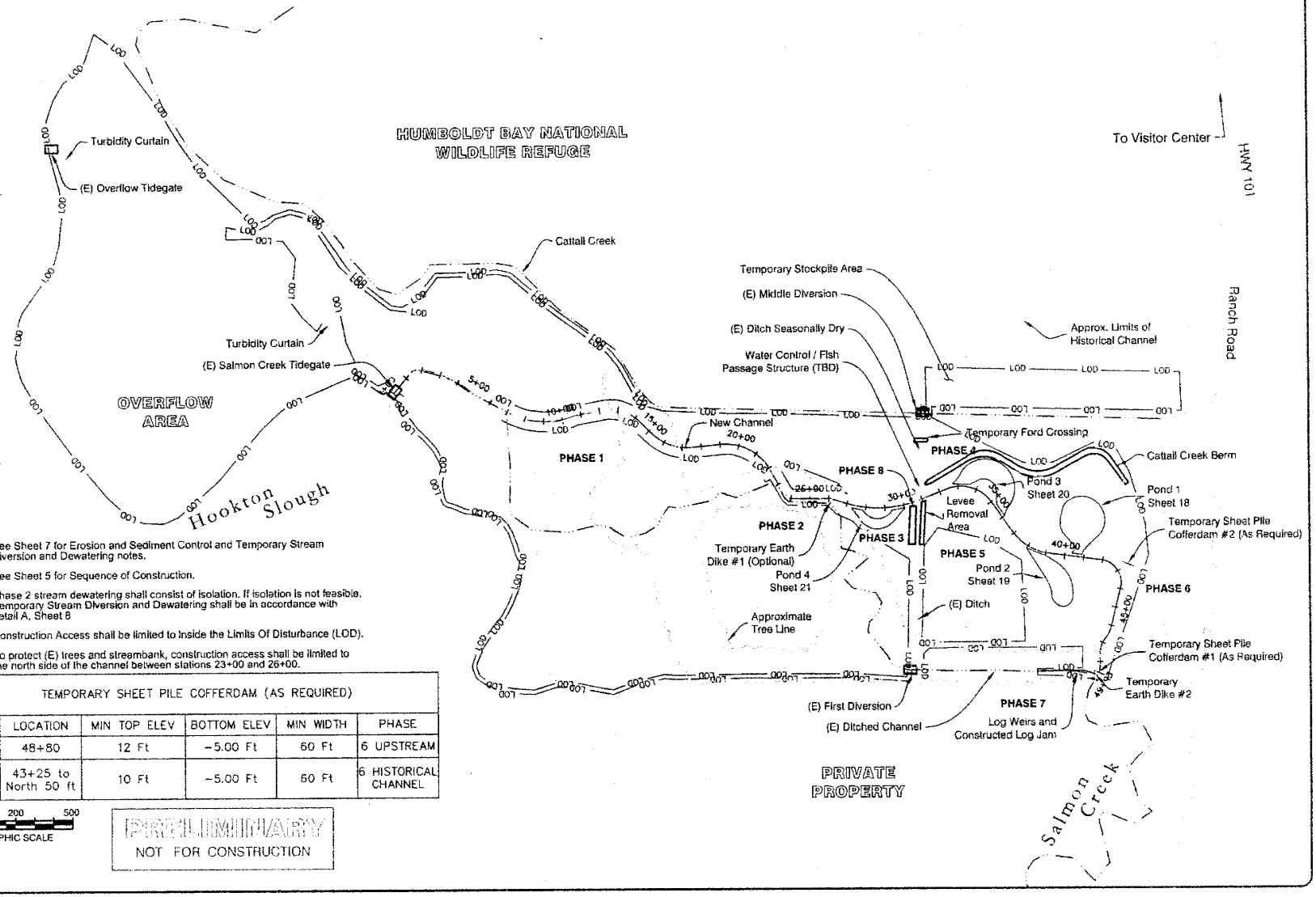
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

GENERAL NOTES AND SEQUENCE OF CONSTRUCTION

Date: Jan. 2010
Submittal: 90% Design
Design: Love / Shea
Drawn: Llanos
Sheet: 5 of 31



Notes

1. See Sheet 7 for Erosion and Sediment Control and Temporary Stream Diversion and Dewatering notes.
2. See Sheet 5 for Sequence of Construction.
3. Phase 2 stream dewatering shall consist of isolation. If isolation is not feasible, Temporary Stream Diversion and Dewatering shall be in accordance with detail A, Sheet 8
4. Construction Access shall be limited to inside the Limits Of Disturbance (LOD).
5. To protect (E) trees and streambank, construction access shall be limited to the north side of the channel between stations 23+00 and 26+00.

TEMPORARY SHEET PILE COFFERDAM (AS REQUIRED)

	LOCATION	MIN TOP ELEV	BOTTOM ELEV	MIN WIDTH	PHASE
#1	48+80	12 Ft	-5.00 Ft	60 Ft	6 UPSTREAM
#2	43+25 to North 50 ft	10 Ft	-5.00 Ft	60 Ft	6 HISTORICAL CHANNEL

PRELIMINARY
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HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

EROSION CONTROL AND WATER MANAGEMENT PLAN

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET:
6 of 31

Erosion & Sediment Control Notes

General Notes

1. Erosion and sediment control shall comply with the California Stormwater Quality Association Stormwater Best Management Practice Handbook for Construction, 2003 (WQCB, 2003).
2. It is the responsibility of the contractor to minimize erosion and prevent the transport of sediment to the adjacent stream and sensitive areas. Unless otherwise noted, applicable WQCB, 2003 Best Management Practices (BMP's) to be implemented include but are not limited to:

   EC-2 Preservation of Existing Vegetation

   EC-6 Straw Mulch

   EC-7 Geotextile and Mats

   EC-9 Earth Dikes and Drainage Swales

   EC-10 Velocity Dissipation Devices

   SE-1 Silt Fence

   NS-2 Dewatering Operations

   NS-4 Temporary Stream Crossing

   NS-5 Clear Water Diversion

   WM-9 Sanitary/Septic Waste Management

   The Contractor, as necessary, shall implement other BMP's specified in WQCB (2003) dictated by site conditions.
3. Contractor shall keep project areas generating dust well watered during the term of the contract.
4. Discharges of potential pollutants from construction sites shall be prevented using source controls to the maximum extent practicable. Potential pollutants include but are not limited to: sediment, trash, nutrients, pathogens, petroleum hydrocarbons, metals, concrete, cement, asphalt. Lime, paint, stains, glues, wood products, pesticides, herbicides, chemicals, hazardous waste, sanitary waste, vehicle or equipment wash water and chlorinated water.
5. Unless otherwise indicated, excavated material shall not be stockpiled overwinter, unless written approval is obtained from the Owner, an approved sediment control plan is obtained by Contractor and sediment control measures are installed.
6. Soil and material stockpiles shall be properly protected to minimize sediment and pollutant transport from the construction site.
7. Solid waste, such as trash, and debris, shall be placed in designated collection areas or containers. The construction site shall be cleared of solid waste daily, or as necessary, and regular removal and proper disposal shall be arranged.

Temporary Stream Isolation, Diversion, and Dewatering Measures

1. Temporary Stream Diversion shall conform to these construction documents and the following specifications:
   a. NS-2 Dewatering Operations
   b. NS-5 Clear Water Diversion
   c. Caltrans, 2003 19-3.03 and 5-1.02 (Temporary Sheetpile Earth Dikes)
   d. EC-9 Earth Dikes and Drainage Swales
   e. EC-10 Velocity Dissipation Devices
2. Contractor shall be responsible for providing pumps, pipes, Earth Dikes with adequate capacity to maintain dry working conditions in the work area during construction and to divert streamflow during non-work hours.
3. Contractor shall use gravity stream diversion pipe as much as feasible. Earth Dikes shall not be overtopped during operation of the gravity pipe stream diversion.
4. Earth dikes shall be constructed of salvaged material. Material shall not be salvaged from the existing stream channel.
5. The outlet of the gravity pipe or stream bypass pump shall be placed on a washed cobble energy dissipater at least 3 feet x 3 feet and 1-foot thick placed in the channel upstream of the downstream fish screen.
6. The outlet of the dewatering pump shall be placed on a washed cobble energy dissipater at least 3 feet x 3 feet and 1-foot thick a minimum of 50 feet from the channel to a flat area able to receive water and allow it to percolate into the soils.
7. Any pumps used on-site shall be placed on absorbent pads. The contractor shall have spill containment materials located at the site, with operators trained in spill control procedures.
8. Prior to commencing any excavation or demolition work, the fish screens and stream isolation measures shall be installed and fish removed from the project area. Contractor shall coordinate with the Owner who will be responsible for removing fish and for scheduling placement of fish screens, stream isolation, and dewatering measures. The Owners designated Fisheries Biologist is responsible for siting the best location for fish screens.
9. Fish screening and removal will be required where a clearwater diversion is planned. Screening and fish removal locations are indicated in the Sequence of Construction, but additional locations may be required. Contractor shall coordinate with Owner before any clear water diversion is implemented.
10. Temporary sheet pile cofferdams shall not be driven and shall be installed using vibratory methods. Temporary sheet piling shall be installed so that it does not obstruct the flow of the existing channel.
11. To minimize tidal flows within the project area, the Owner will fully shut the adjustable openings in the Salmon Creek and Overflow Tidegates throughout the duration of construction.
12. Temporary Stream Diversion shall be continually operated until work area is fully stabilized.
13. Dewatering may be necessary when working in off-channel conditions. Contractor shall be prepared to implement dewatering operations so that dewatering occurs in a timely manner and does not impact the construction schedule. See Typical B Sheet 8.
14. The historical stream channel within Phase 6 may be fully saturated. Contractor shall be prepared to implement dewatering operations so that dewatering occurs in a timely manner and does not impact the construction schedule.

Temporary Stream Ford

1. Temporary stream crossing (Ford) shall be in accordance with NS-4.
2. Temporary Stream crossings shall be removed on or before October 15 and before the adjustable tide gates are opened.
3. Temporary Ford shall be constructed to meet existing bank elevations with salvaged material and overlain with 1-foot minimum depth of aggregate. Aggregate shall be underlain by geotextile (See EC-7).

Permanent Seeding

1. Permanent stabilization, unless otherwise specified shall include the following, unless otherwise noted:
   a. Seed Mix TBD.
   b. Straw Mulch in accordance with EC-6.
2. Permanent seeding and straw mulch shall be installed in all areas disturbed by the project, including graded stream channels beyond the limit of grading. Permanent seeding shall not be installed below elevation 5.0 in the Overflow Area.
3. See Excavation Notes, this sheet, for ground preparation prior to seeding.

Erosion Control Matting

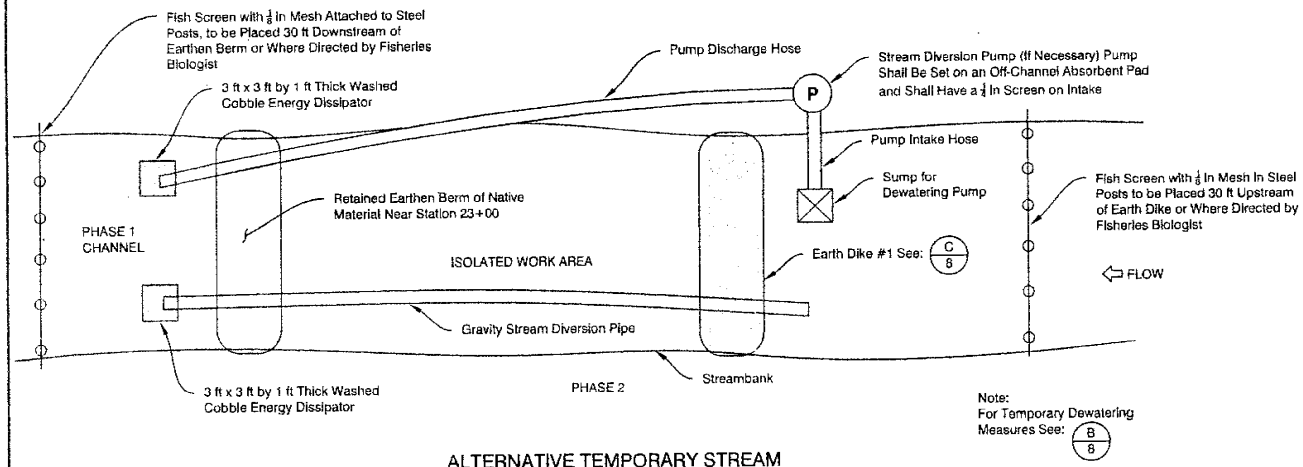
1. Erosion Control Matting shall be 100% biodegradable coir fiber. No netting will be permitted. Erosion Control Matting shall consist of consist of machine produced matting that meets the following minimum specifications:

Material:	woven coir fiber yarn or twine
Thickness:	0.30 inches
Weight:	20 oz/sy
Open area:	39% to 50%
Life expectancy:	3 years.

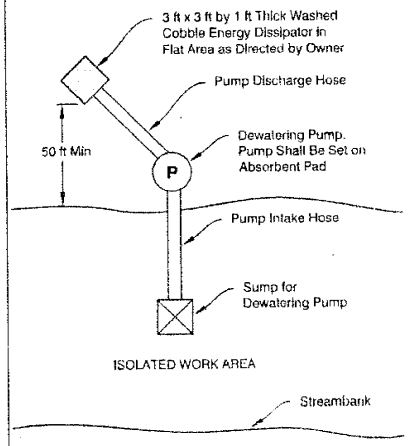
2. Erosion Control Matting shall be installed along both channel banks between Stations 44+00 and 49+05 between elevations 4.5 feet and the limit of grading, unless indicated otherwise. Matting shall be installed between the limit of grading and the bottom of the streambank.
3. Erosion Control Matting shall be installed in accordance with EC-7 and manufacturer's direction.
4. Matting overlaps shall be a minimum of six inches in the downstream/down slope direction.
5. Seeding shall be installed prior to Erosion Control Matting installation.

Excavation Notes

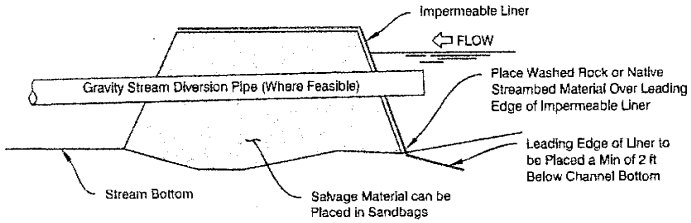
1. Excavation, backfill, and embankment construction shall be in accordance with Caltrans 2006 Section 19 General Excavation, and as indicated in these construction documents.
2. Excavation within the limits of the historical channel in Phase 6 may necessitate additional excavation to obtain stable side slopes, as directed by the Owner.
3. Excavation shall include excavation and handling of saturated soils. Contractor shall be prepared to dewater and /or transport saturated soil in a manner that prevents excess discharge or spillage of soils or water within the construction access area or on adjacent properties or roadways. Should any discharge occur, the Contractor shall be responsible for immediate and complete clean up.
4. Unless otherwise specified, the tolerance for finished grading shall be plus or minus 0.1 foot. The tolerance for horizontal locations shall be plus or minus 1 foot.
5. A portion of excavated material, selected by Owner, (approx XX CY) shall be stockpiled on site at the direction of the Owner for Refuge repairs conducted by others. The Owner will be responsible for providing Erosion and Sediment Control for material stockpiled for use unrelated to the project.
6. Suitable material that is excavated shall be salvaged at direction of Owner, and stockpiled on site for re-use as follows (volumes approximate):
   a. 2,500 CY of salvaged clay for Cattail Creek Berm
   b. 1,000 CY of topsoil (Qcsm) for the Cattail Creek Berm
   c. 1,100 CY of clay for the Log Step Pools and Constructed Log Jam
   d. 800 CY of salvaged topsoil for pond shorelines.
   e. 800 CY of salvaged clay for structure trench backfill.
7. All Structure trencg backfill shall be salvaged clay compacted in accordance with Excavation note #8 unless otherwise directed.
8. Compaction of the salvaged clay core in the Cattail Creek Berm, as channel material for The Log Step Pools and as trench backfill for log and rock structures shall be in accordance with CALTRANS 19-5 and as follows:
   a. Material shall be placed and compacted in 8 inch layers
   b. Each Layer shall be compacted with a Sheeps Foot Roller or approved equivalent with a minimum of 4 passes over all parts of the layer.
   c. Owner may require additional roller passes.
   d. Stockpiled clay shall be placed such that it can drain and shall be covered with plastic to minimize drying.
9. Large log material encountered during channel excavation shall be stockpiled at the direction of the Owner.
10. At the completion of construction, construction access roads shall be restored to pre-construction or better conditions. Roads shall be graded to removal all ruts, but re-rocking will not be required except at tidegate approaches.
11. At the completion of construction, overbank areas and fields used for construction access shall be disked to a to a maximum size of 3-inch particles then smoothed to create a finished surface to the satisfaction of the Owner that will not pond water and that is mowable.
12. A large LOD has been provided in open areas to allow Contractor flexibility in haul routes. Hall routes shall vary to minimize soil compaction and rutting. Owner reserves right to require changes in haul routes to minimize impacts.



A ALTERNATIVE TEMPORARY STREAM DIVERSION PHASE 2
Detail Plan (NTS)



B TEMPORARY DEWATERING MEASURES
Typical Plan (NTS)



C TEMPORARY EARTH DIKE
Typical Profile (NTS)

Notes

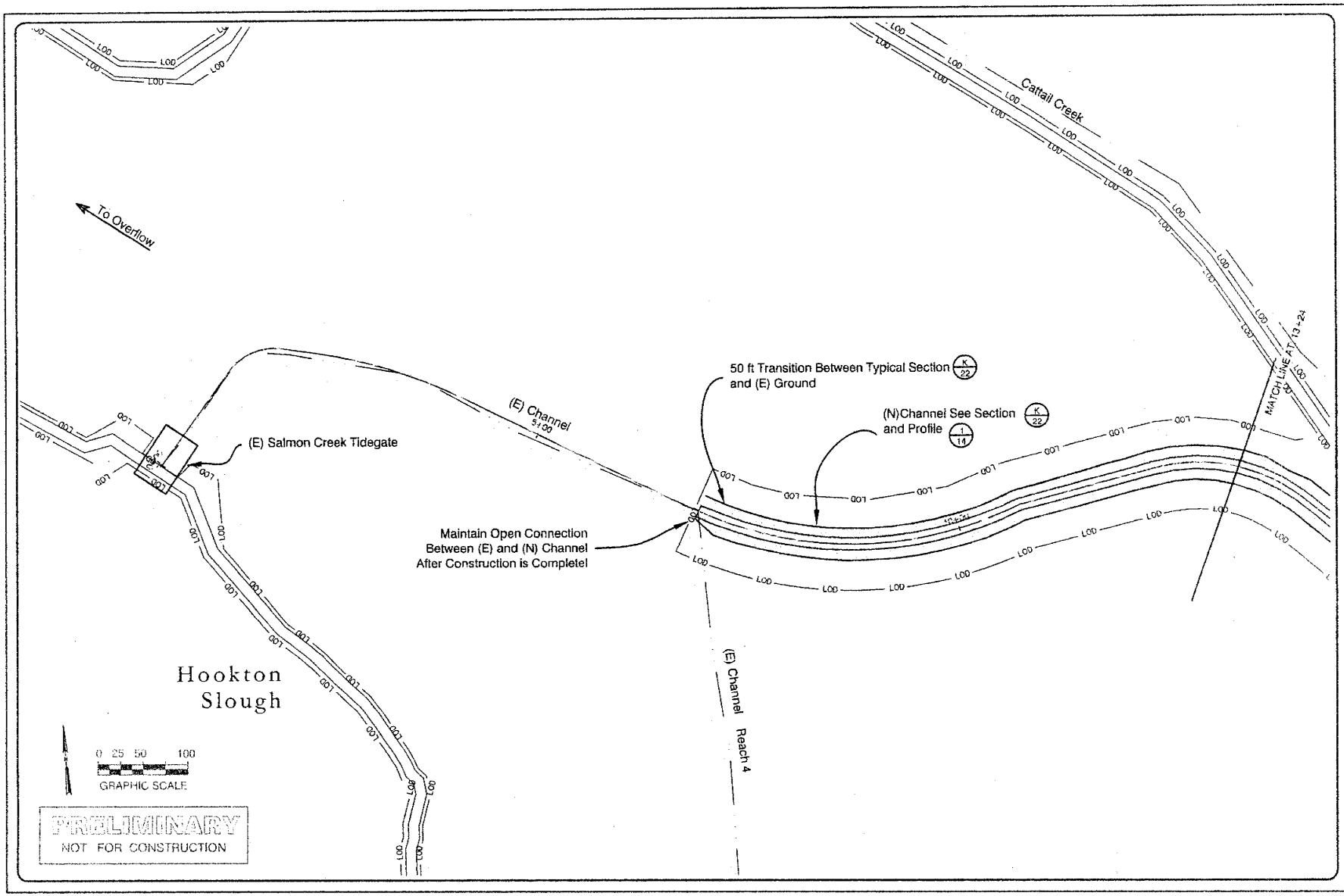
1. See Sheet 7 for Erosion and Sediment Control Notes including Temporary Stream Diversion and Dewatering notes.

Michael Love & Associates
Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

WATER MANAGEMENT DETAILS

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 8 of 31



Michael Love & Associates

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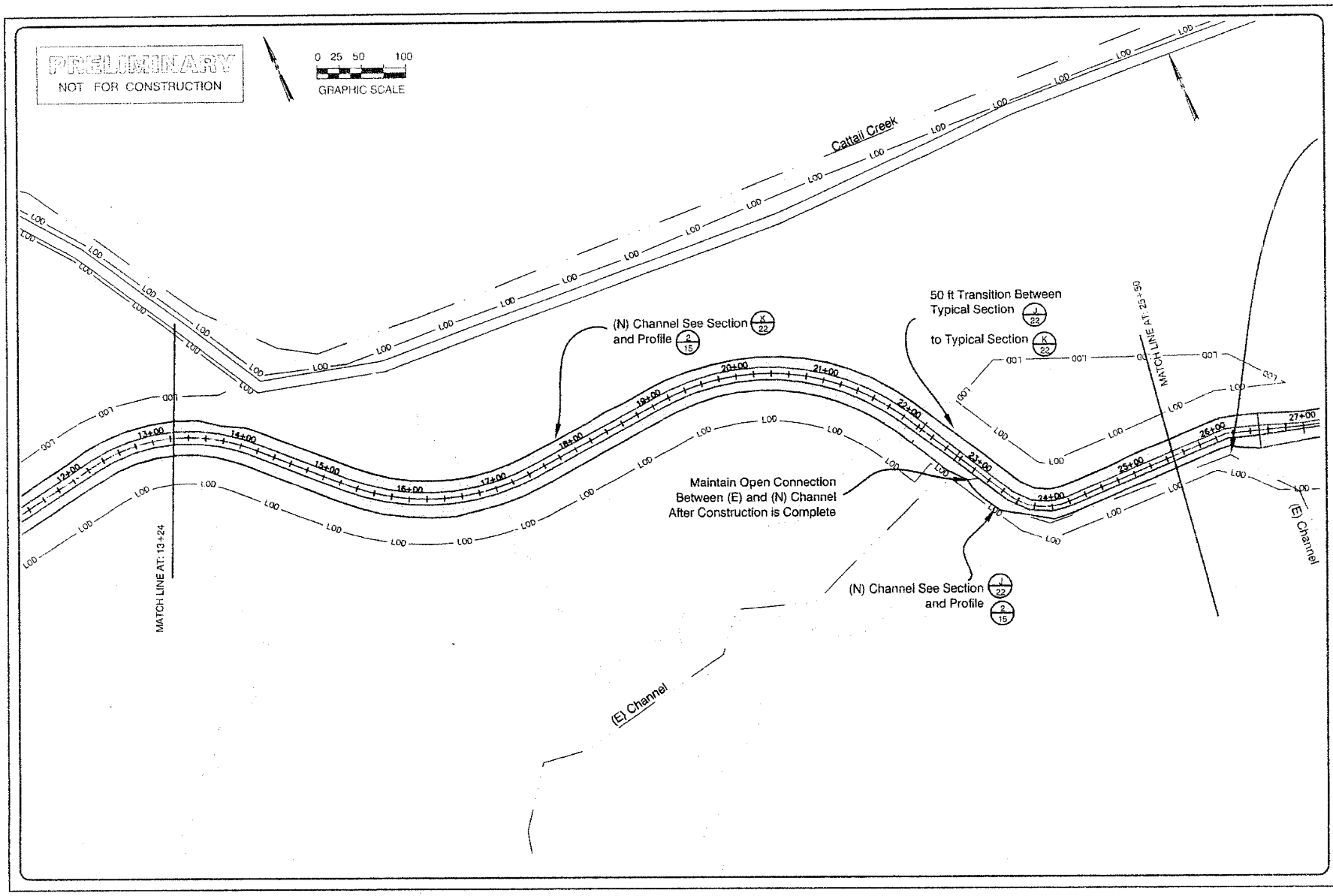
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE

Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PLAN
STA 0+00 TO 13+24

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 9 of 31



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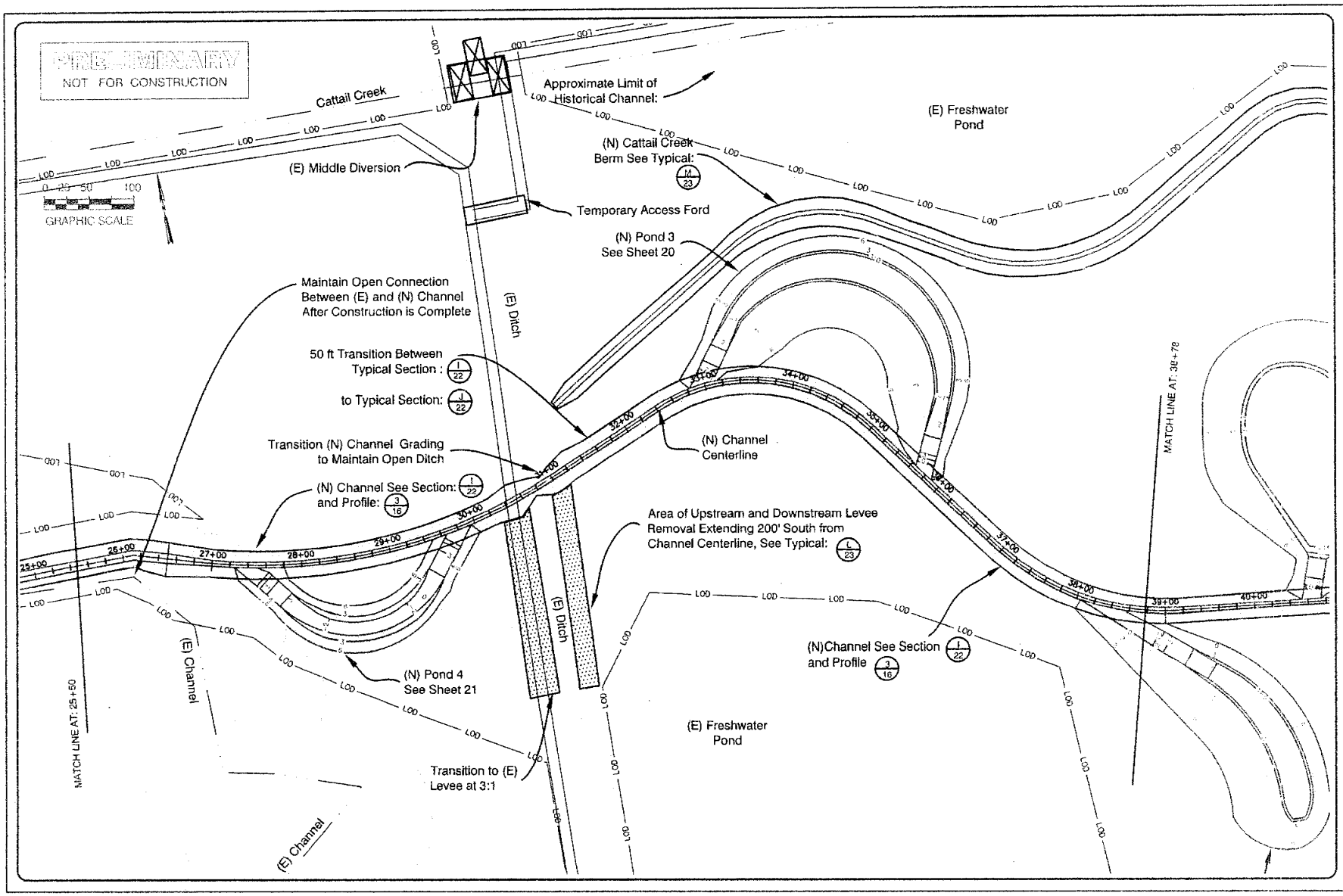
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PLAN
STA 13+24 TO 25+50

DATE
Dec. 2010
SUBMITTAL
90% Design
DESIGN
Love / Shea
DRAWN
Llanos
SHEET
10 of 31



Michael Love & Associates

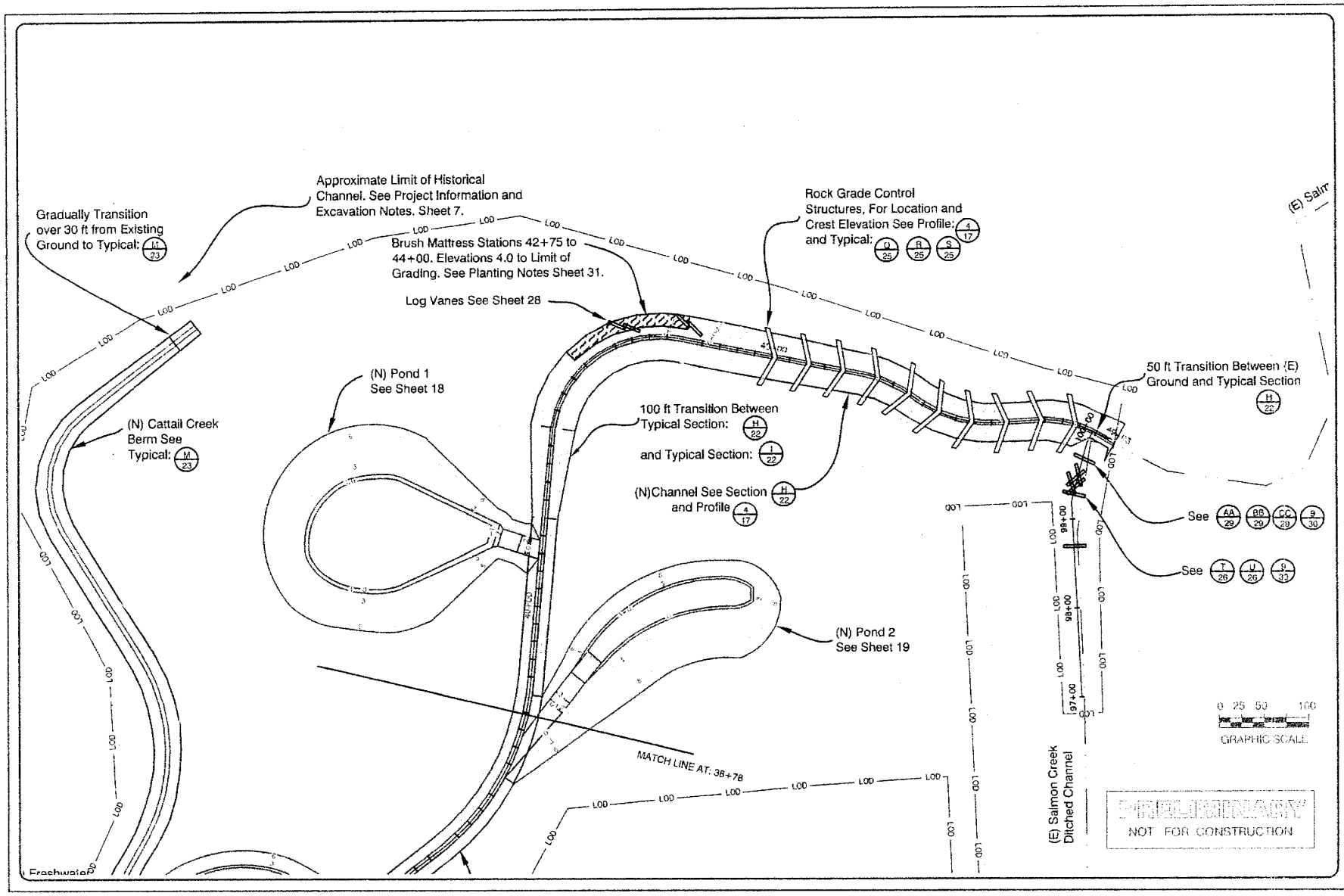
PROJECT MANAGEMENT: Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE

Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PLAN
STA 25+50 to 38+78

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 11 of 31



Michael Love & Associates

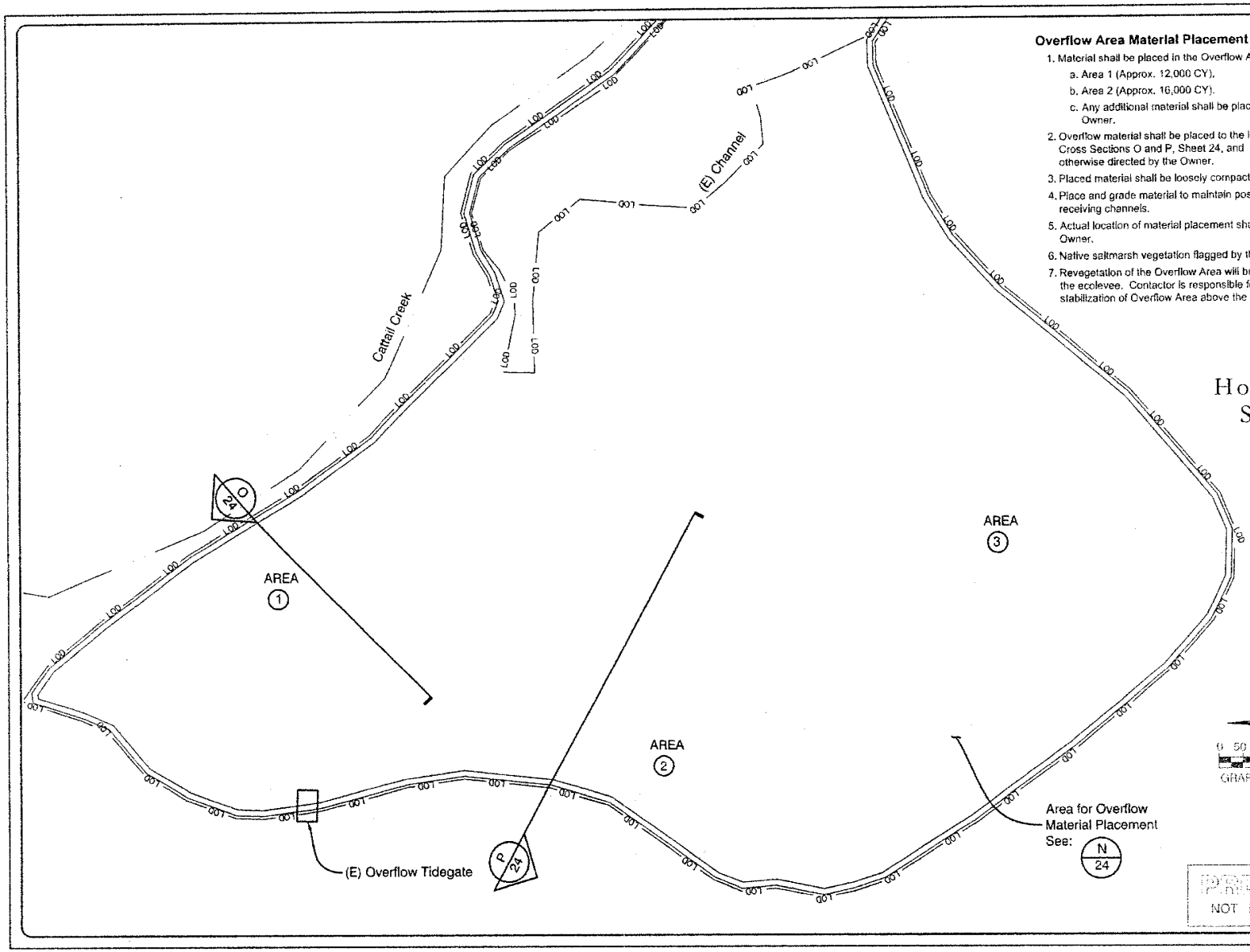
PROJECT MANAGEMENT: Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE

Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PLAN
STA 39+78 to 49+03

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 12 of 30



Overflow Area Material Placement Notes

1. Material shall be placed in the Overflow Area in the following order:
   a. Area 1 (Approx. 12,000 CY),
   b. Area 2 (Approx. 16,000 CY).
   c. Any additional material shall be placed in Area 3 as specified by the Owner.
2. Overflow material shall be placed to the line and grade specified on Cross Sections O and P, Sheet 24, and Typical N, Sheet 24, unless otherwise directed by the Owner.
3. Placed material shall be loosely compacted.
4. Place and grade material to maintain positive drainage to existing receiving channels.
5. Actual location of material placement shall be at the direction of the Owner.
6. Native saltmarsh vegetation flagged by the Owner shall be protected.
7. Revegetation of the Overflow Area will be by the Owner below the toe of the ecolevee. Contactor is responsible for permanent seeding and stabilization of Overflow Area above the toe elevation of the ecolevee.

PRELIMINARY
NOT FOR CONSTRUCTION

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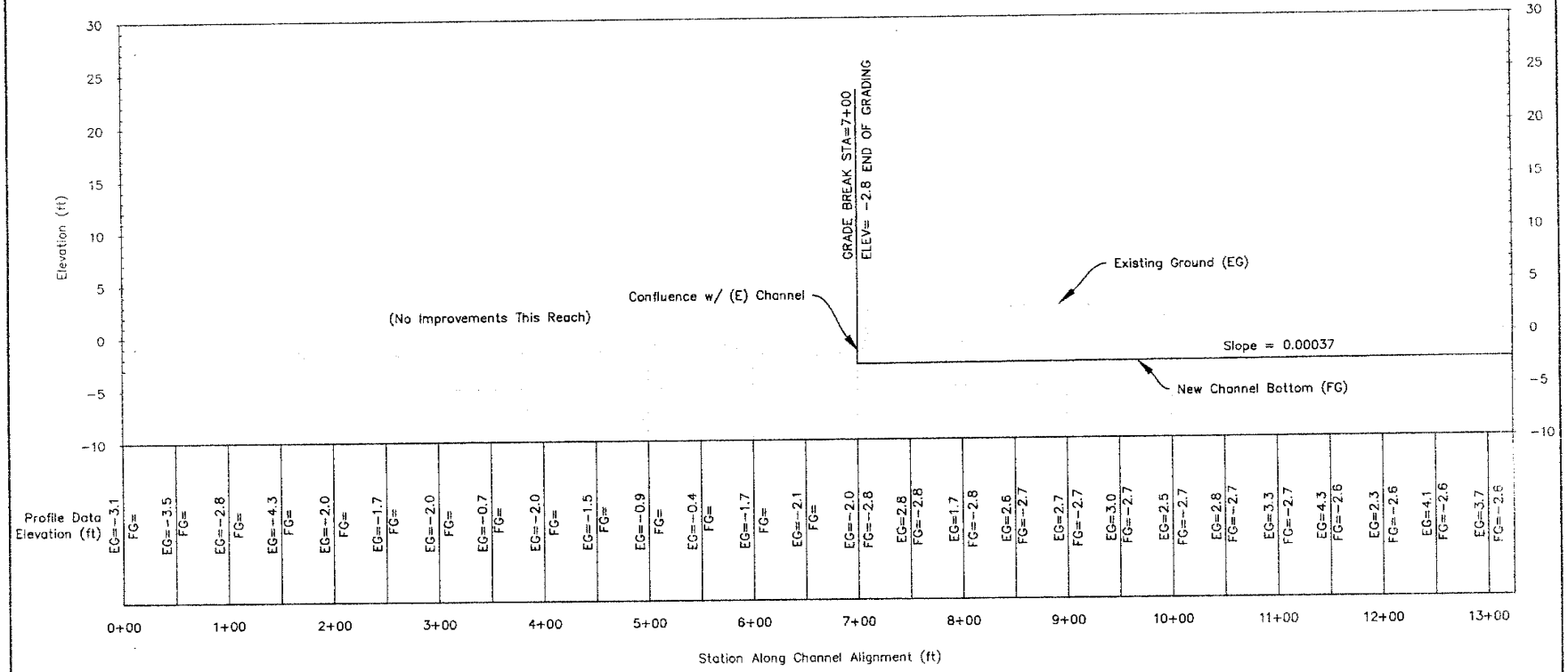
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

OVERFLOW AREA PLAN

DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 13 of 31

PRELIMINARY
NOT FOR CONSTRUCTION



0 50 100
GRAPHIC SCALE

1/9 CHANNEL PROFILE - 0+00 to 13+24
Vertical Exaggeration 10:1

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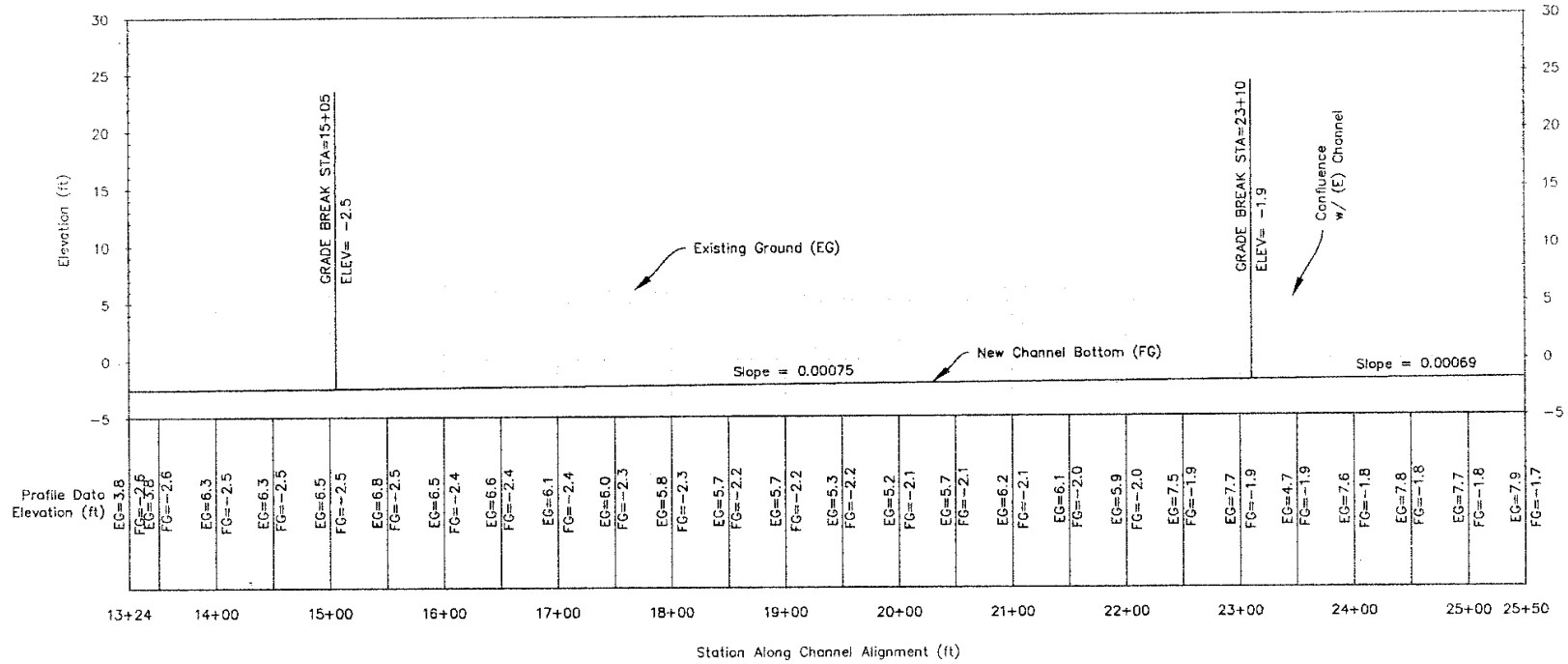
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PROFILE
0+00 to 13+24

DATE: Nov. 2009
SUBMITTAL: 60% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 14 of 31

PRELIMINARY
NOT FOR CONSTRUCTION



0 50 100
GRAPHIC SCALE

2/10 CHANNEL PROFILE - 13+24 to 25+50
Vertical Exaggeration 10:1

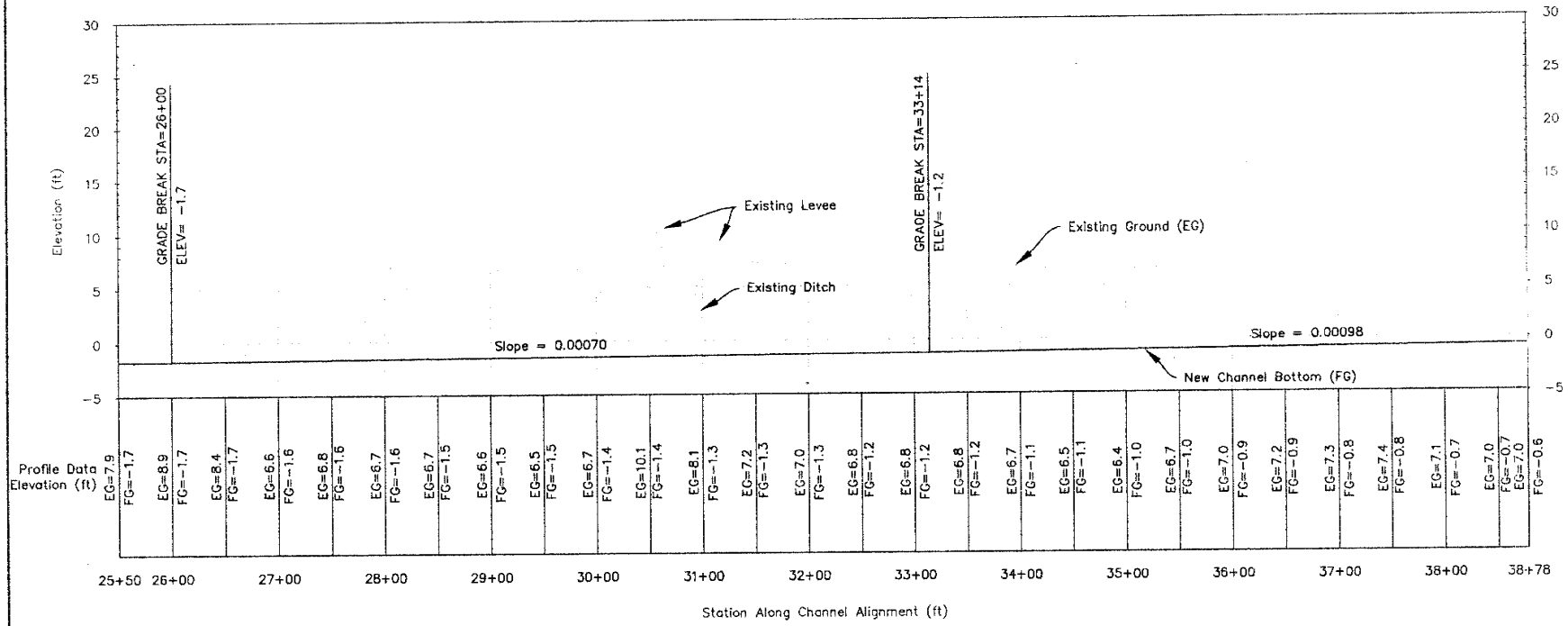
Michael Love & Associates
Project: Pacific Coast Fish, Wildlife, and Wetlands Restoration Assoc.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PROFILE
13+24 to 25+50

DATE: Nov. 2009
SUBMITTAL: 60% Design
DESIGN: Love / Shea
DRAWN: Uanos
SHEET: 15 of 31

PRELIMINARY
NOT FOR CONSTRUCTION



0 50 100
GRAPHIC SCALE

3/11 CHANNEL PROFILE - 25+50 to 38+78
Vertical Exaggeration 10:1

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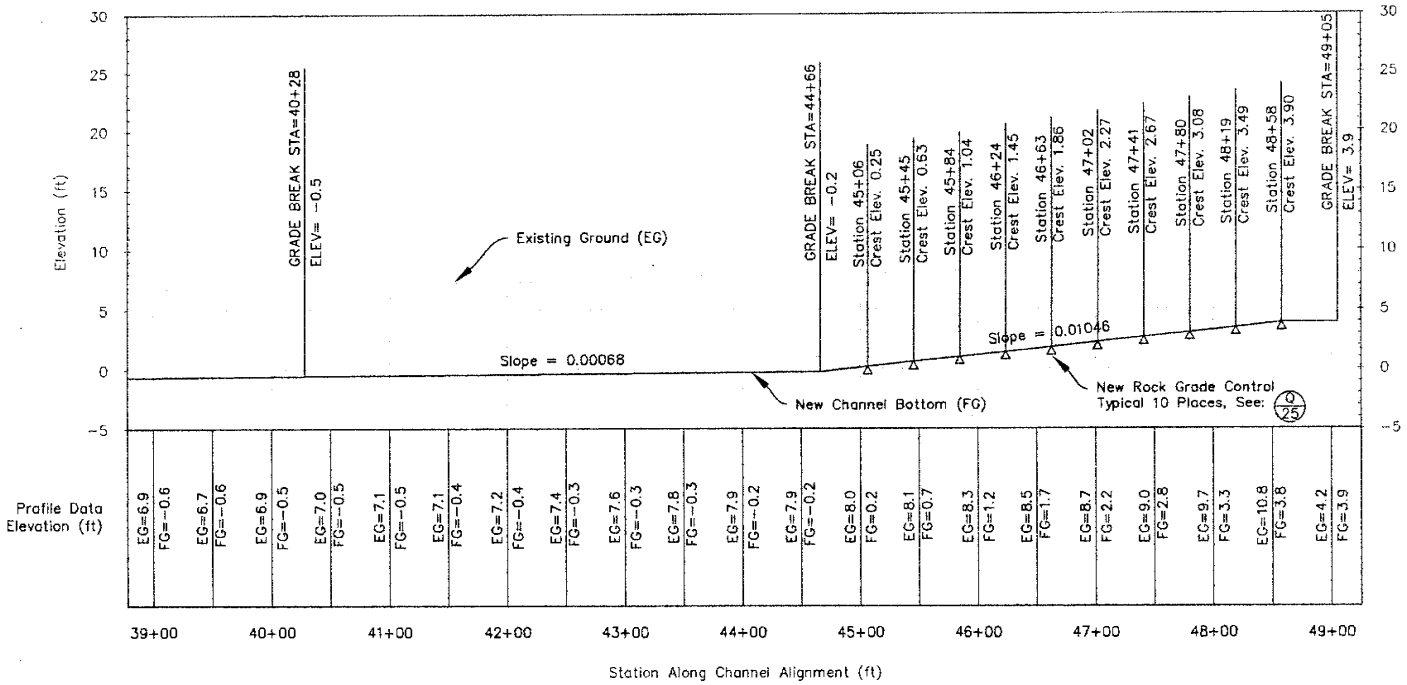
Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PROFILE
25+50 to 38+78

DATE
Nov. 2009
SUBMITTAL
60% Design
DESIGN
Love / Shea
DRAWN
Llanos
SHEET
16 of 31

PRELIMINARY
NOT FOR CONSTRUCTION



0 50 100
GRAPHIC SCALE

4/12 CHANNEL PROFILE - 38+78 to 49+05
Vertical Exaggeration 10:1

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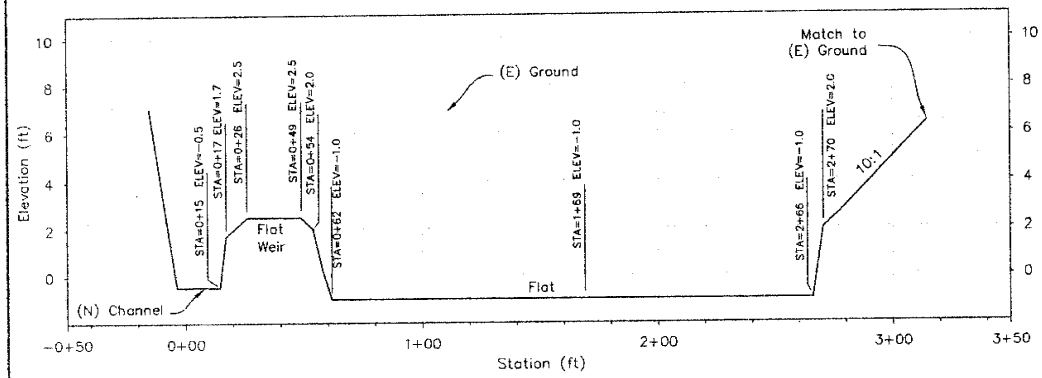
STATE OF CALIFORNIA

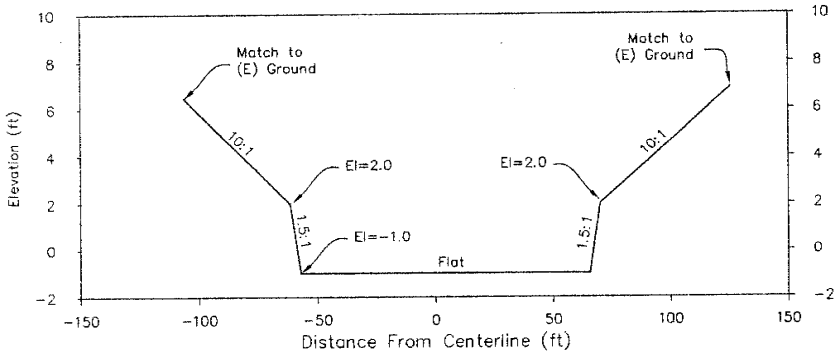
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

CHANNEL PROFILE
38+78 to 49+05

DATE
Nov. 2009
SUBMITTAL
60% Design
DESIGN
Love / Shea
DRAWN
Llanos
SHEET
17 of 31



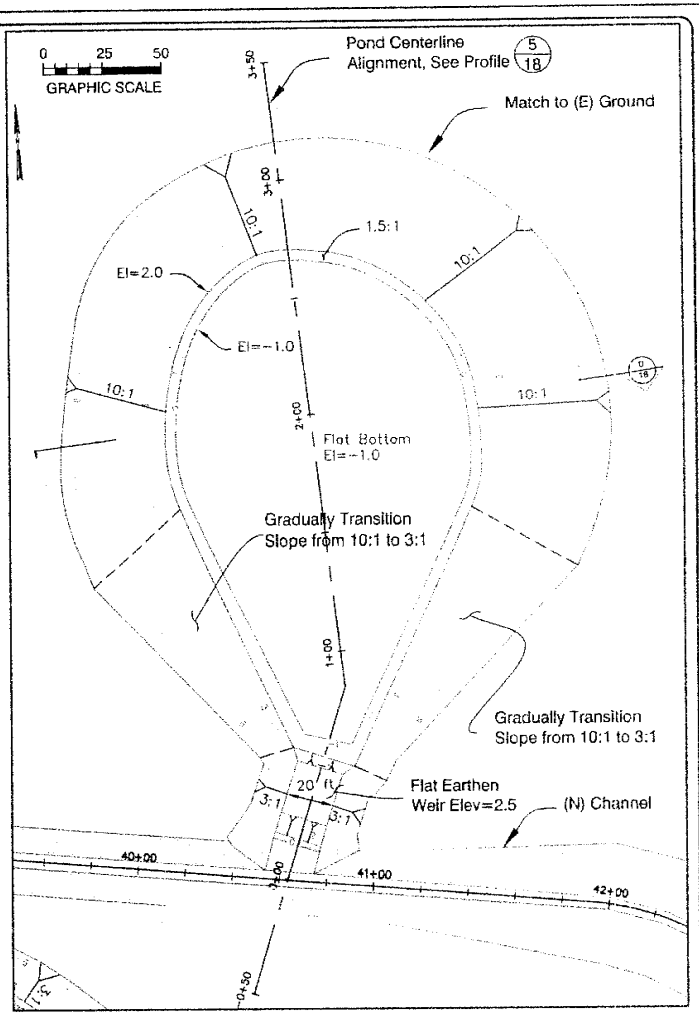
5/18 POND 1
Profile - Vertical Exaggeration 10:1



D/18 POND 1
Cross Section - Vertical Exaggeration 10:1

NOTES:

1. Contractor shall install up to three Log Pond Habitat Structures, See Typical V, Sheet 27. Locations to be determined by Owner.
2. Salvaged topsoil shall be loosley placed to a 3-inch depth to meet finished grade of ponds between the weir elevation and the limit of grading. Salvaged topsoil shall be disked to a maximum size of 3-inch particles before spreading.
3. Pond weirs shall be constructed in undisturbed clay. In the event that suitable clay is not present or existing ground is disturbed below the finished weir elevations, weir shall be reconstructed of salvaged clay compacted in accordance with Excavation Note #8, Sheet7.



POND 1
Plan

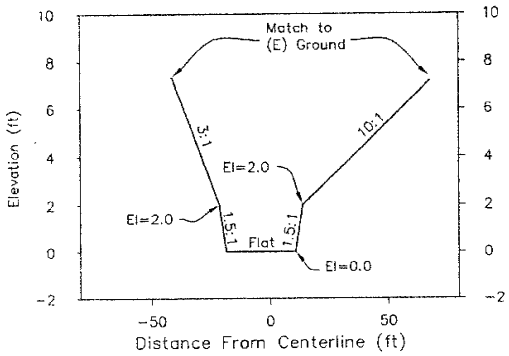
PRELIMINARY
NOT FOR CONSTRUCTION

Michael Love & Associates
Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

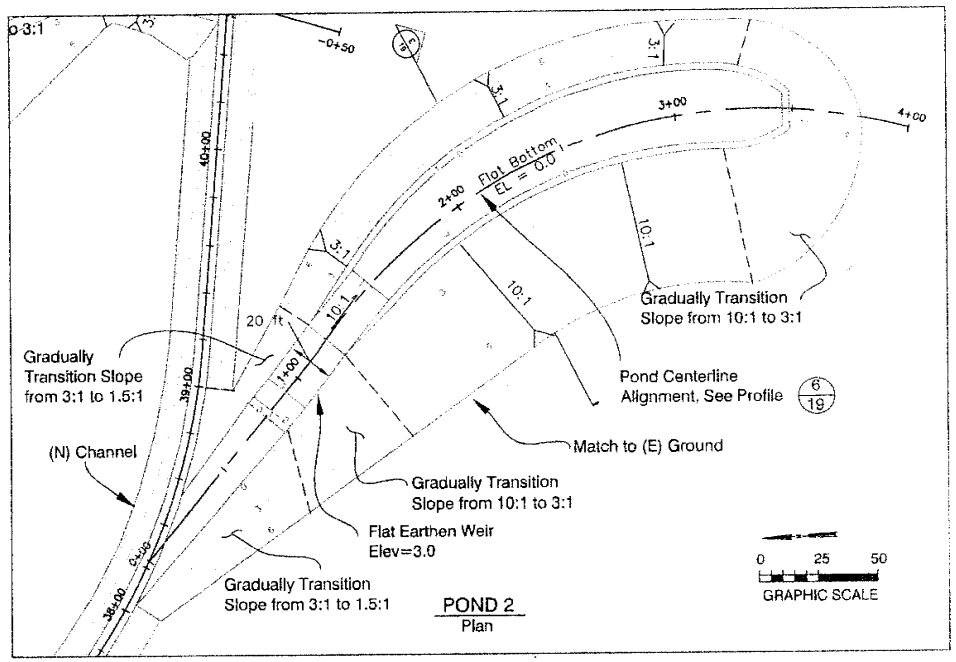
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

POND 1
PLAN, PROFILE, SECTION

DATE Jan. 2010
SUBMITTAL 90% Design
DESIGN Love / Shen
DRAWN Llanos
SHEET 18 of 31



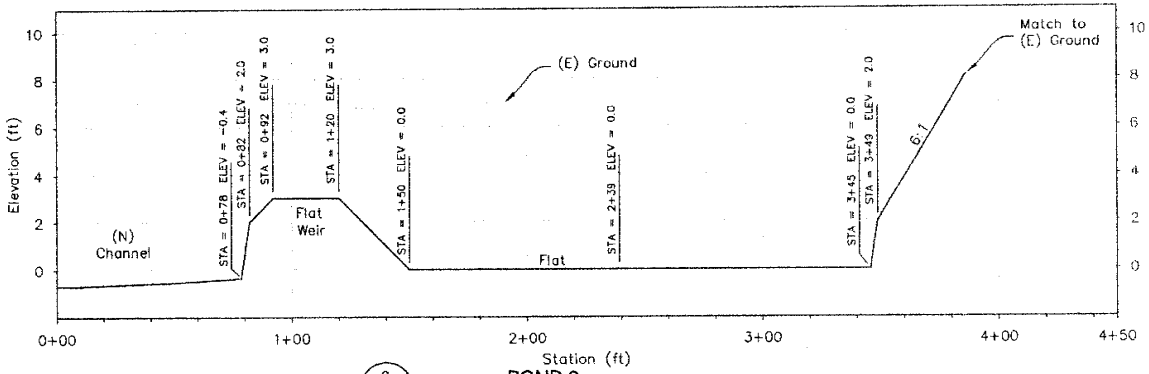
E / 19 POND 2
Cross Section - Vertical Exaggeration 10:1



POND 2
Plan

NOTES:

1. Contractor shall install up to three Log Pond Habitat Structures. See Typical V, Sheet 27. Locations to be determined by Owner.
2. Salvaged topsoil shall be loosley placed to a 3-inch depth to meet finished grade of ponds between the weir elevation and the limit of grading. Salvaged topsoil shall be disked to a maximum size of 3-inch particles before spreading.
3. Pond weirs shall be constructed in undisturbed clay. In the event that suitable clay is not present or existing ground is disturbed below the finished weir elevations, weir shall be reconstructed of salvaged clay compacted in accordance with Excavation Note #8, Sheet7.



6 / 19 POND 2
Profile - Vertical Exaggeration 10:1

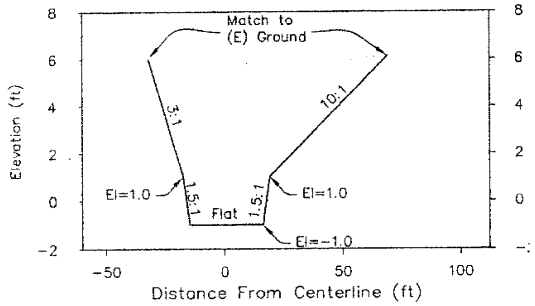
PRELIMINARY
NOT FOR CONSTRUCTION

Michael Love & Associates
Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

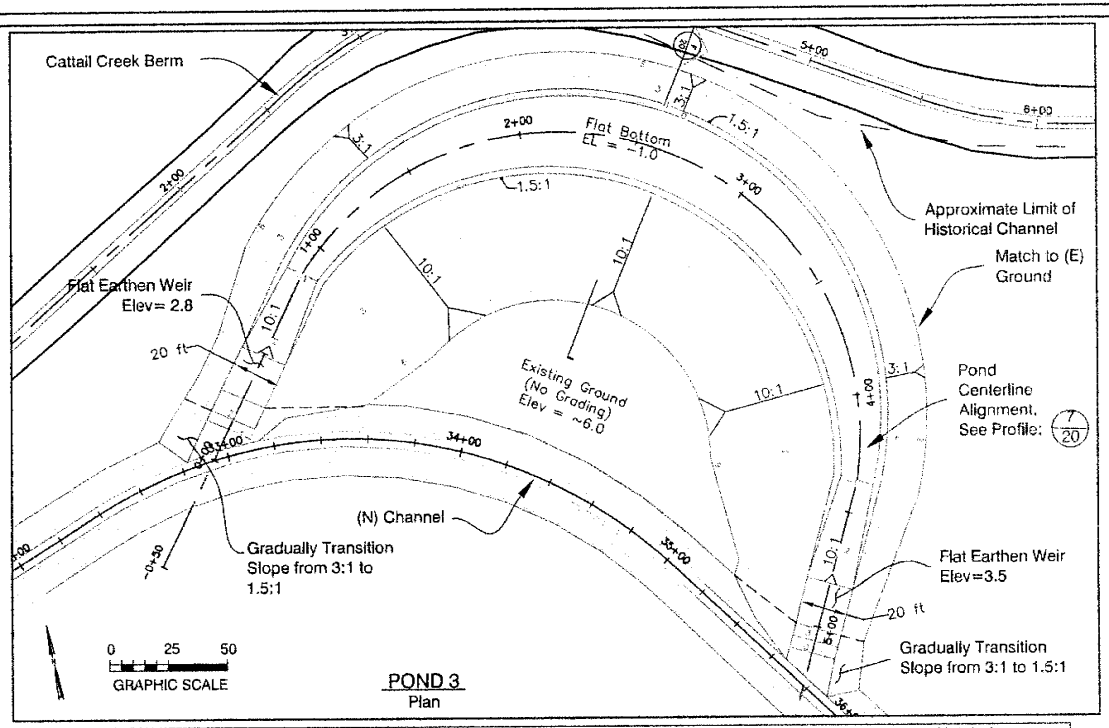
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

POND 2
PLAN, PROFILE, SECTION

DATE Jan. 2010
SUBMITTAL 90% Design
DESIGN Love / Shea
DRAWN Llanos
SHEET 19 of 31



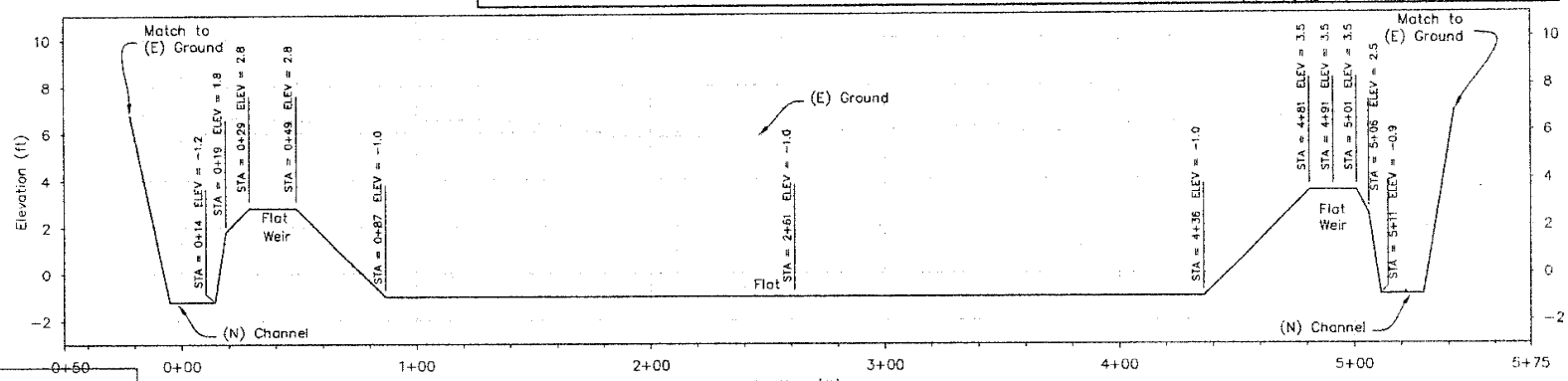
F / 20 POND 3
Cross Section - Vertical Exaggeration 10:1



POND 3
Plan

NOTES:

1. Contractor shall install up to three Log Pond Habitat Structures, See Typical V, Sheet 27. Locations to be determined by Owner.
2. Salvaged topsoil shall be loosley placed to a 3-inch depth to meet finished grade of ponds between the weir elevation and the limit of grading. Salvaged topsoil shall be disked to a maximum size of 3-inch particles before spreading.
3. Pond weirs shall be constructed in undisturbed clay. In the event that suitable clay is not present or existing ground is disturbed below the finished weir elevations, weir shall be reconstructed of salvaged clay compacted in accordance with Excavation Note #8, Sheet7.



7 / 20 POND 3
Profile - Vertical Exaggeration 10:1

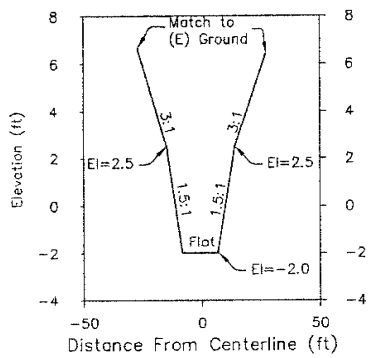
PRELIMINARY
NOT FOR CONSTRUCTION

Michael Love & Associates
Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

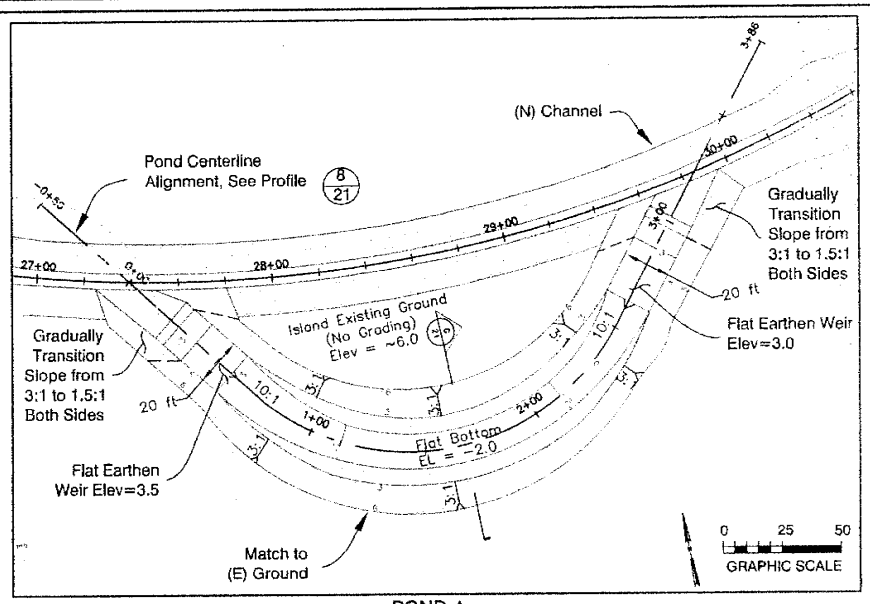
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

POND 3
PLAN, PROFILE, SECTION

DATE Jan. 2010
SUBMITTAL 90% Design
DESIGN Love / Sliea
DRAWN Llanos
SHEET 20 of 31



G / 21 POND 4
Cross Section - Vertical Exaggeration 10:1

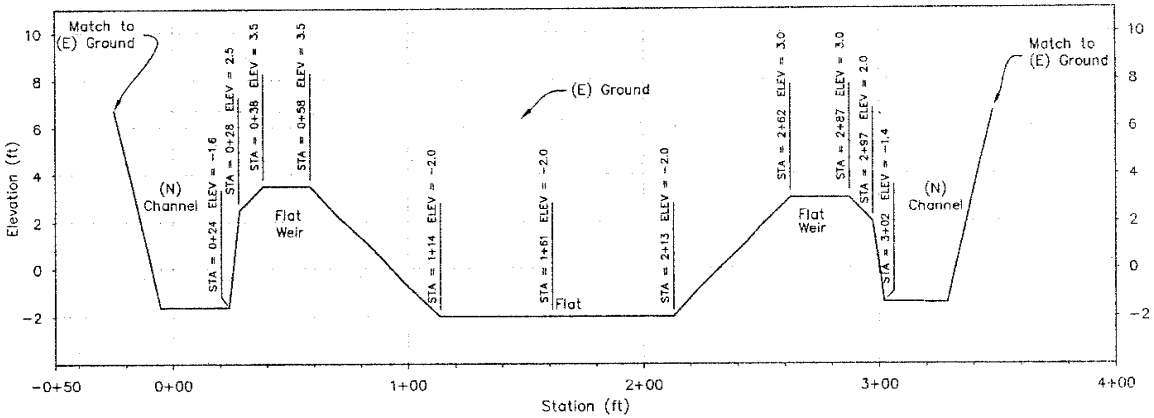


POND 4
Plan

NOTES:

1. Contractor shall install up to three Log Pond Habitat Structures. See Typical V, Sheet 27. Locations to be determined by Owner.
2. Salvaged topsoil shall be loosley placed to a 3-inch depth to meet finished grade of ponds between the weir elevation and the limit of grading. Salvaged topsoil shall be disked to a maximum size of 3-inch particles before spreading.
3. Pond weirs shall be constructed in undisturbed clay. In the event that suitable clay is not present or existing ground is disturbed below the finished weir elevations, weir shall be reconstructed of salvaged clay compacted in accordance with Excavation Note #8, Sheet7.

PRELIMINARY
NOT FOR CONSTRUCTION



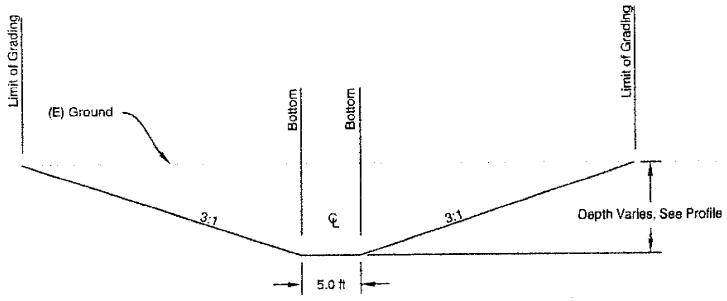
8 / 21 POND 4
Profile - Vertical Exaggeration 10:1

Michael Love & Associates
PROJECT MANAGEMENT: Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

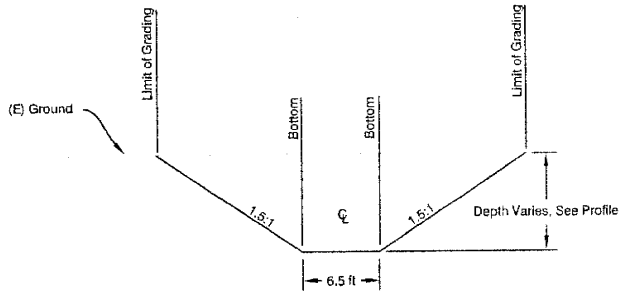
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

POND 4
PLAN, PROFILE, SECTION

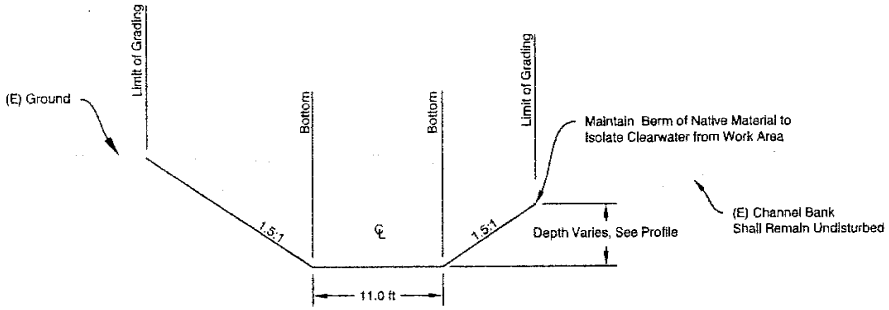
DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 21 of 31



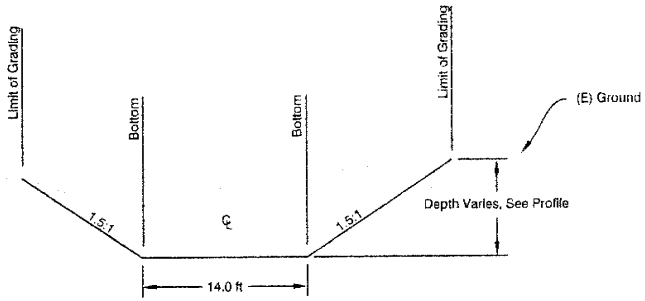
H / 12 TYPICAL GRADING CROSS SECTION
Station 42+00 to 49+00



I / 11, 12 TYPICAL GRADING CROSS SECTION
Station 32+00 to 41+00



J / 10, 11 TYPICAL GRADING CROSS SECTION
Station 22+75 to 31+50



K / 9, 10 TYPICAL GRADING CROSS SECTION
Station 7+50 to 22+25

Notes:

1. All cross sections are looking upstation.

2. Transitions between adjacent reach cross section and with the existing channel shall be gradual over a minimum of 50 feet of channel length, unless otherwise specified

0 5 10
GRAPHIC SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

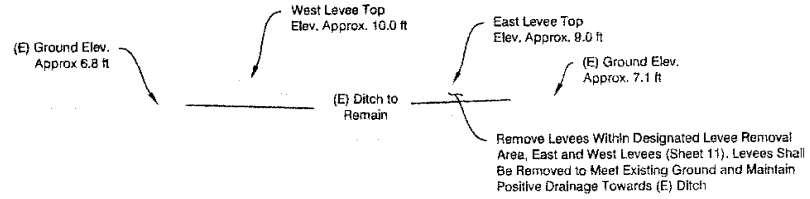
Michael Love & Associates
Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

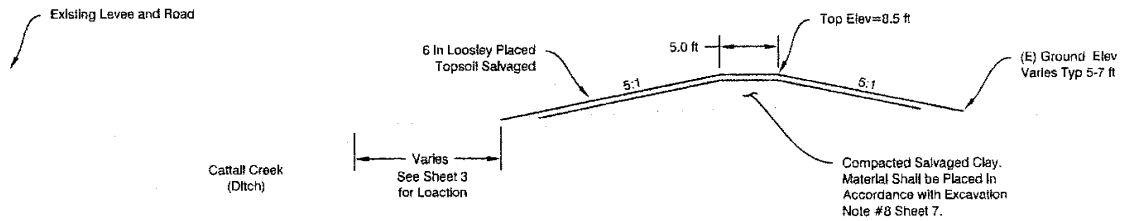
STREAMCHANNEL TYPICAL CROSS SECTIONS SHEET 1

DATE Jan. 2010
SUBMITTAL 90% Design
DESIGN Love / Shea
DRAWN Llanos
SHEET 22 of 31

PRELIMINARY
NOT FOR CONSTRUCTION



L / 11 **LEVEE REMOVAL**
Typical Cross Section (NTS)



M / 11 **CATTAIL CREEK BERM**
Typical Cross Section (NTS)

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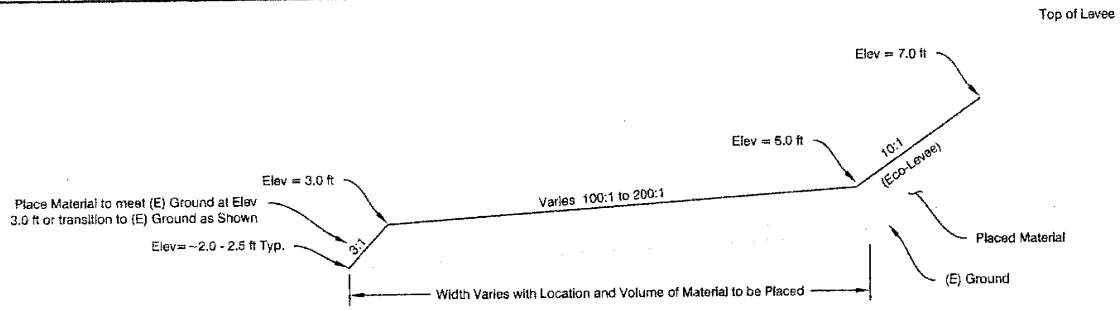
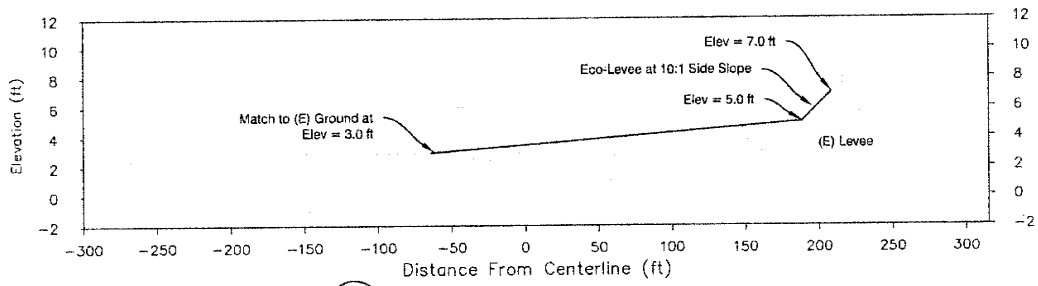
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

TYPICAL CROSS SECTIONS
SHEET 2

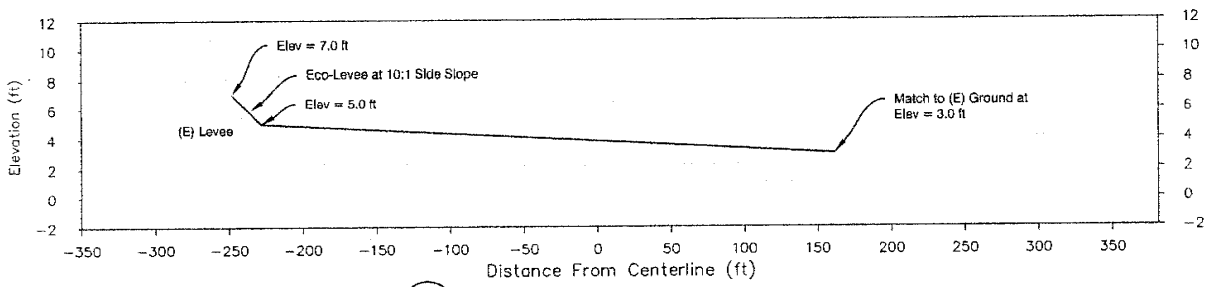
DATE: Jan. 2010
SUBMITTAL: 90% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 23 of 31



N / 13 MATERIAL PLACEMENT OVERFLOW AREAS 1-3
Typical Cross Section (NTS)



O / 13 MATERIAL PLACEMENT IN OVERFLOW AREA 1
Cross Section



P / 13 MATERIAL PLACEMENT IN OVERFLOW AREA 2
Cross Section

PRELIMINARY
NOT FOR CONSTRUCTION

Note:

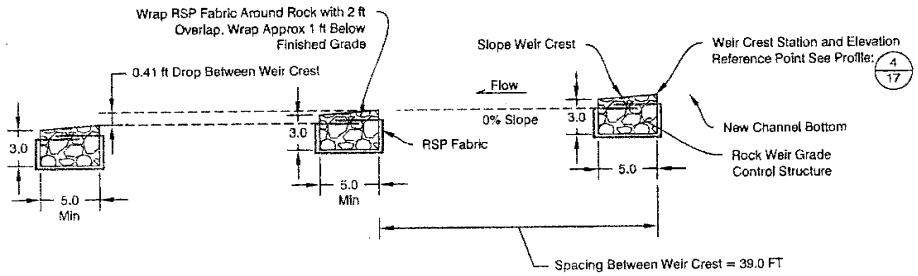
See notes regarding Overflow Area Material Placement Sheet13.

Michael Love & Associates
Project: Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

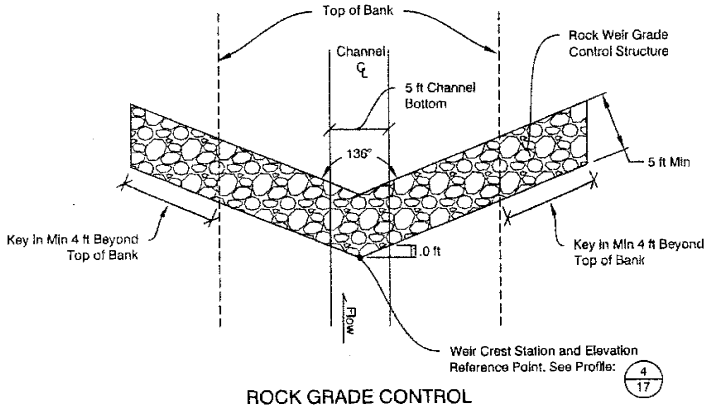
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

OVERFLOW AREA
CROSS SECTIONS

Date: Jan. 2010
Submittal: 90% Design
Design: Love / Shea
Drawn: Llanos
Sheet: 24 of 31



Q/12 ROCK GRADE CONTROL STRUCTURES
Typical Profile (NTS)



R/12 ROCK GRADE CONTROL STRUCTURES
Typical Plan (NTS)

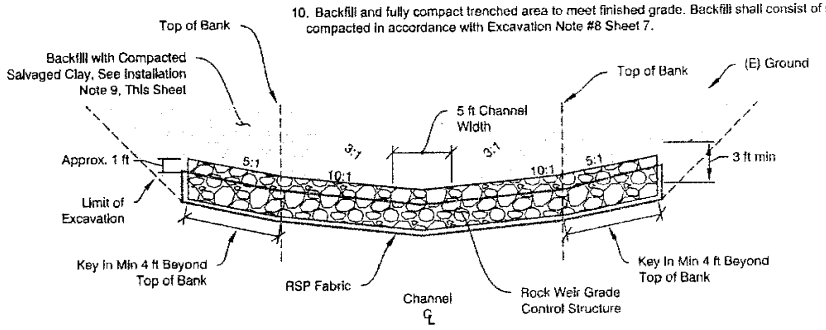
Rock Grade Control Notes

Material Specifications

1. All rock diameters (D) are measured along the intermediate axis. The least dimension (minor axis) of an individual rock fragment shall not be less than one-third the greatest dimension of the fragment.
2. Rock shall meet gradations as follows:
   a. D95 2.5 feet
   b. D50 1.3 feet
   c. Dmin 0.5 feet
3. Rock shall be placed in accordance with Caltrans, 2006 Section 72 and using "Method A" placement as specified in Caltrans, 2006 Section 72-2.03
4. All large rock shall be placed individually and secured by machine tamping. Fill voids with smaller material to obtain a compact, low-permeability mass.
5. Rock Slope Protection Fabric (RSP Fabric) shall be Type B nonwoven as specified in Caltrans, 2006 Section 88.

Installation Specifications

1. Rock grade control structures shall be constructed to the line and grade as specified in the contract documents.
2. Excavate trench to the specified minimum width and depth for the entire rock grade control structure.
3. Do not over-excavate trench. Contractor shall attempt to maintain in situ materials to the extent possible. Contractor may employ wooden forms (or other material) to maintain trench dimensions. Forms shall be removed after rock placement. In the event that the materials forming the trench are too loose, Contractor shall notify owner. At Owners direction Contractor shall place additional rock to meet specified dimmensions and elevations.
4. Place RSP fabric in trench as shown in the contract documents with overlapping joints in accordance with Caltrans, 2006 Section 72-2.025.
5. Place larger rocks in an evenly distributed pattern across the entire length and width of the trench. Individually place each rock such that it exerts pressure on each adjacent rock.
6. Place smaller rocks to fit securely on top of and between larger rocks beneath. Rocks shall have a minimum of four contact points and be securely supported. Rocks shall not protrude more than 0.5 feet beyond finished grade.
7. Backfill Placed Rock with salvaged sand and gravel to fill all voids in the rock surface.
8. While placing rock, wrap RSP Fabric around entire structure approximately 1 foot below finished grade. RSP Fabric ends shall overlap a minimum of 2 feet.
9. Rocks shall not be cabled together.
10. Backfill and fully compact trenched area to meet finished grade. Backfill shall consist of salvaged clay, compacted in accordance with Excavation Note #8 Sheet 7.



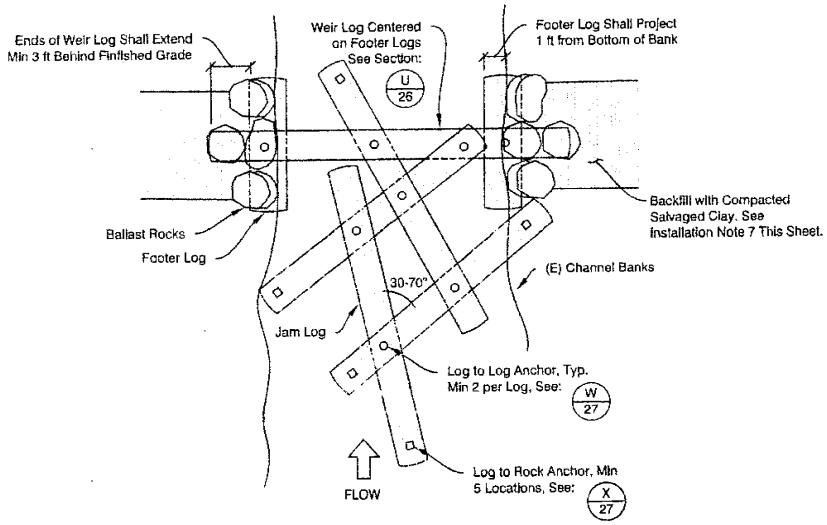
S/12 ROCK GRADE CONTROL STRUCTURES
Typical Cross Section (NTS)

Michael Love & Associates
Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

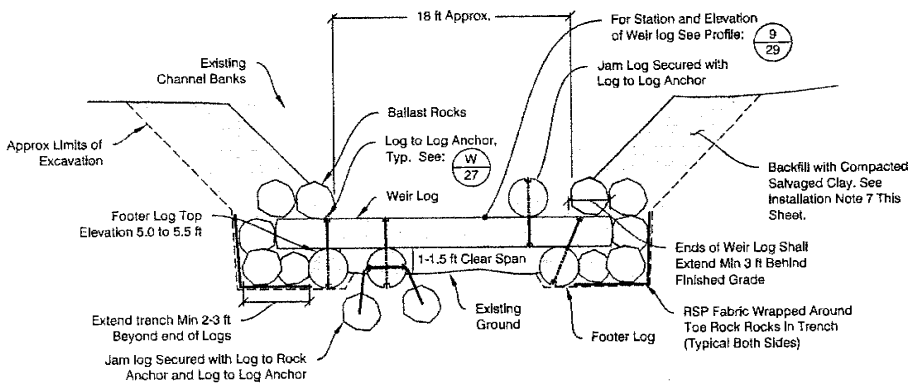
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

TYPICAL ROCK GRADE CONTROL STRUCTURES

DATE: Nov. 2009
SUBMITTAL: 60% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 25 of 31



T 12 LOG JAM
Detail Plan (NTS)



U 12 WEIR LOG
Detail Cross Section (NTS)

Log Jam Notes

Material Specifications

1. Contractor shall use large logs provided on site and salvaged during excavation at the direction of the Owner. Logs shall not be cut unless at the direction of the Owner.
2. Logs will be selected by Owner and log placement will be at the direction of the Owner.
3. Structure shall consist of a minimum of five major structural logs including one Weir Log and four Jam Logs. Jam Logs shall be larger than 24 inches in diameter and a minimum of 20 feet in length. Weir Logs shall be a minimum of 24 inches in diamter and a minimum of 24 ft in length. Structural logs shall consist of a single log.
4. Footer Logs shall be larger than 24 inches in diameter and a minimum of 5 feet in length.
5. Shorter or smaller diameter logs can be incorporated into the structure as Jam Logs at the direction of the Owner.
6. Brush shall consist of small limbs and branches (1 to 6 inch diameter) salvaged from clearing and grubbing operations. Brush shall be a minimum of 5 feet long and contain multiple branches.
7. Anchoring shall be in accordance with Detail X for Log to Rock Anchoring, Sheet 27, and Detail W for Log to Log Anchoring, Sheet 27, and with Ballast rock as shown onDetails U and T this sheet.
8. Anchor rocks shall be a minimum of 2000 lbs (1 ton RSP). Anchor Rocks shall only be used to secure Jam Logs.
9. Ballast Rocks shall be a minimum of 1,000 lbs (1/2 ton RSP). Ballast Rock shall only be used to secure Weir Log.
10. Approximately 40,000 pounds of anchor weight shall be installed for the Log Jam Structure as shown. Ballast rock weight will contribute to the anchor weight. Additional anchoring weight will be required if additional logs are installed. Owner will determine total ballast weight and weight per anchor after logs are selected for the structure.
11. RSP fabric shall be Type 2, nonwoven as specified in Caltrans, 2006 section 88.

Installation Specifications

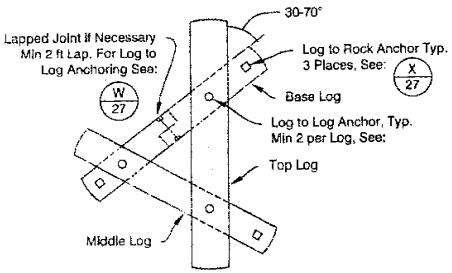
1. The Contractor shall install the Log Jam to the line, grade and detail described in the Contract Documents.
2. Excavate trench in each streambank for footer log and weir log installation. Trench shall extend 2 - 3 ft beyond end of Log Weir.
3. Footer logs shall be installed such that their tops meet the elevation specified to achieve the specified clear-span under the Weir Log.
4. Footer logs shall project one foot maximum from the toe of the streambank.
5. The Weir Log shall be centered on the Footer Logs and shall extend a minimum of 3 feet behind finished grade on each side. The Weir Log shall be anchored to the Footer Log using Log to Log Anchoring.
6. Ballast Rocks shall be stacked on top of the Footer Logs and Weir Log such that they cannot roll towards the stream. RSP Fabric shall be wrapped around sides and bottom of Ballast Rocks behind finished grade.
7. Trenches shall be backfilled and fully compacted with salvaged clay in accordance with Excavation Note #8, Sheet 7. Bank slope shall be reconstructed to original bank slope, but not steeper than 1.5H:1V.
8. Jam Logs shall be placed such that they overlap 3 to 6 feet from the ends, unless approved by Owner.
9. Jam Logs shall be placed and interwoven as shown create a 30 to 70 degree angle between logs.
10. Log to log contacts shall be permanently anchored firmly in place at a minimum of two locations between the center and endpoint of each log using Log to Log Anchoring.
11. The log jam structure shall be anchored with a minimum of five Log to Rock Anchors. Anchor Rocks shall be located beneath finished grade where possible.
12. Brush shall be stuffed loosely under raised anchored pieces so that it is held in place. Approximately 50% of the open area under the logs shall be stuffed with brush.

Michael Love & Associates
Project: Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

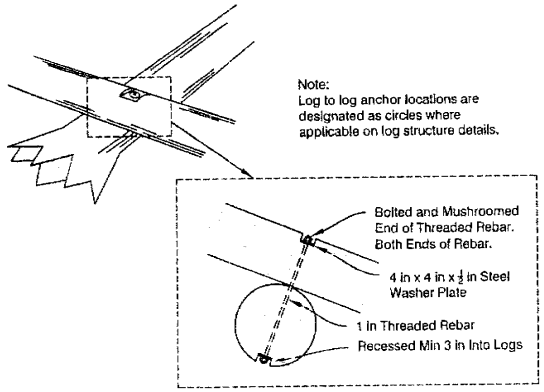
HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

LOG STRUCTURE
DETAILS AND NOTES 1

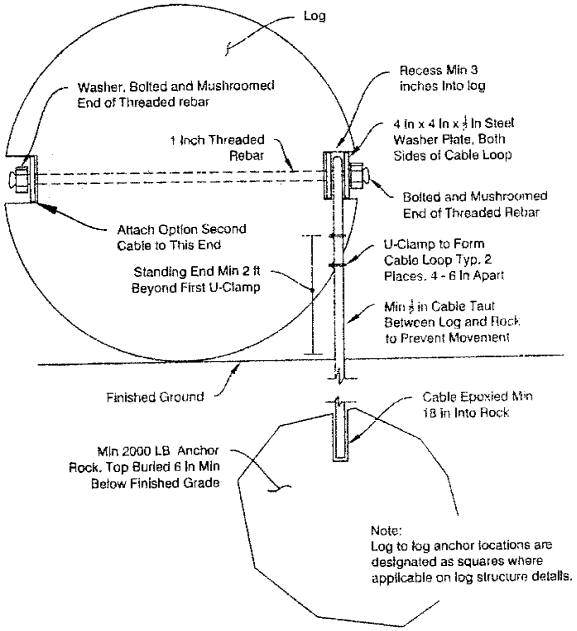
Date: Nov. 2009
Submittal: 60% Design
Design: Love / Shea
Drawn: Llanos
Sheet: 26 of 31



V 18, 19, 20, 21 POND LOG HABITAT STRUCTURE
Typical Plan (NTS)



W 26, 27, 28 LOG TO LOG ANCHORING
Detail Elevation (NTS)



X 26, 27, 28, 29 LOG TO ROCK ANCHORING
Detail Cross Section (NTS)

Pond Log Habitat Structure Notes

Material Specifications

1. Contractor shall use large logs provided on site and salvaged during excavation at the direction of the Owner. Logs shall not be cut unless at the direction of the Owner.
2. Logs will be selected by Owner and log placement will be at the direction of the Owner.
3. Brush shall consist of small limbs and branches (1 to 6 inch diameter) salvaged from clearing and grubbing operations. Brush shall be a minimum of 5 feet long and contain multiple branches.
4. Anchoring shall be in accordance with Detail X for Log to Rock Anchoring, this Sheet, and Detail W for Log to Log Anchoring, this Sheet.
5. Anchor rocks shall be a minimum of 2000 lbs (1 ton RSP). Approximately 16,000 pounds of anchor weight shall be installed per structure. Owner will determine total weight and weight per anchor after logs are selected for the structure.

Installation Specifications

1. Pond Log Habitat Features shall consist of a minimum of two logs including a base log.
2. Base log shall be placed at finished grade anchored at both ends using Log to Rock Anchors.
3. Middle and Top logs shall be placed on top of Base Log such that they overlap a minimum of feet and create a 30 to 70 degree angle between logs, unless otherwise directed by Owner.
4. A minimum of one Middle Log shall slope to meet finished grade and shall be anchored to the ground with Log to Rock Anchors.
5. Middle and Top logs shall be anchored at log to log contact points using Log to Log Anchoring at a minimum of two locations per log.
6. Brush shall be stuffed loosely under raised anchored pieces such that it is held in place. Approximately 50% of the open area under the logs shall be stuffed with brush in each structure.

Anchoring for Wood Structure Notes

Material Specifications

1. Log anchoring shall be in accordance with Detail X for Log to Rock Anchor, this Sheet and Detail W for Log to Log Anchoring, this Sheet.
2. Anchor rocks shall be a minimum of 2000 lbs (1 ton RSP).
3. Threaded rebar, washer and nut shall be steel.
4. Threaded rebar shall be a minimum diameter of 1 inch with 4-inch x 4-inch x ½-inch steel washer plate and bolt.
5. Cable shall minimum ½ inch steel wire rope.
6. Epoxy shall be polyester resin adhesive that is safe for use aquatic environments.
7. Anchoring shall be provided at a weight of 450 pounds per linear foot of log installed in each structure. Owner will compute total anchor weight per structure and weight per anchor.
8. For Log to Rock Anchoring, a maximum of 5,000 pounds of rock shall be placed on a single cable.

Installation Specifications

1. Log anchoring shall be in accordance with Detail X for Log to Rock Anchor, this Sheet and Detail W for Log to Log Anchoring, this Sheet.
2. Log in full contact with the ground shall be anchored to the ground using Log to Rock Anchoring at a minimum of two locations per piece.
3. Rebar shall be inserted through the center of the log and bolted. Rebar, washer, and nut, shall be fully recessed within the log.
4. Anchor shall be located a minimum of 2 feet from the end of the log.
5. If a through-connection cannot be made with rebar, threaded rebar can be driven into an undersized hole in the log a minimum of 10 inches with the permission of the Owner. Two driven rebar connections shall be made to substitute for one through-connection.
6. To minimize movement of logs, anchoring shall be installed such that connections are tight and cable is taut.
7. For Log to Rock Anchoring, cable shall be inserted into rock a minimum of 8 inches near the center of the rock.
8. For Log to Rock Anchoring, anchor rock shall be completely buried a minimum of 6 inches beneath finished grade with cable taut to prevent log movement.
9. For Log to Rock Anchoring, if required anchor weight exceeds the maximum anchor weight per cable, additional cables shall be added to threaded rebar. Anchor rocks shall be cabled together.

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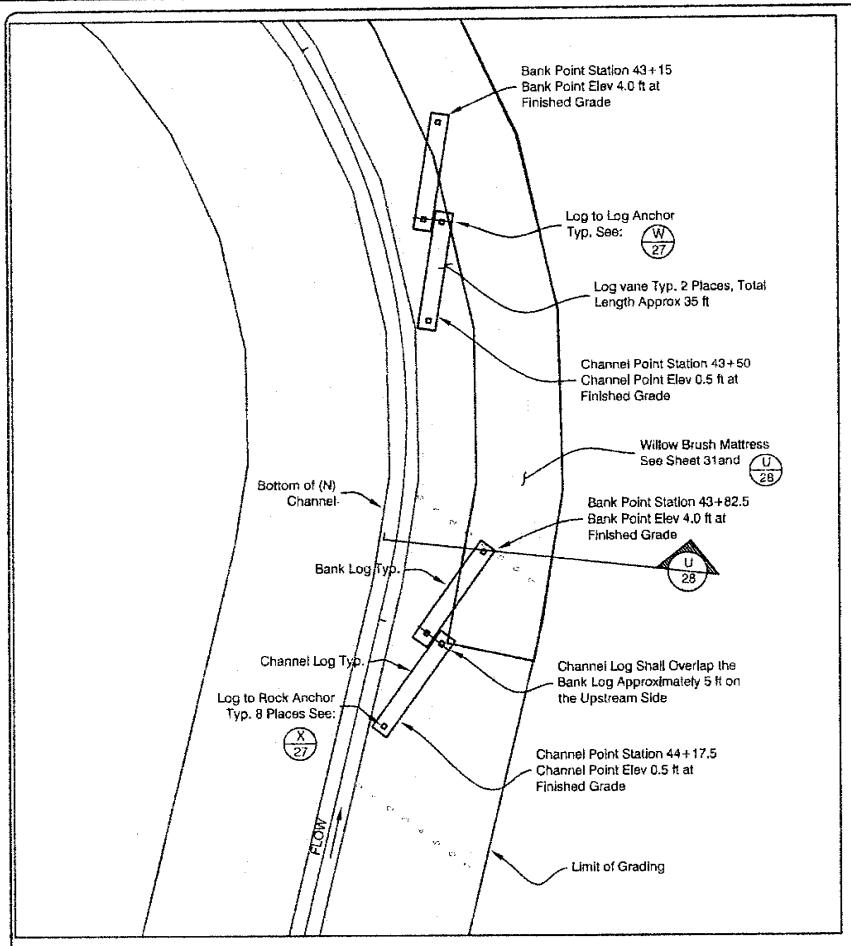
Pacific Coast Fish, Wildlife and Wetlands Restoration Asso...

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2 Habitat Enhancement Project

LOG STRUCTURE DETAILS AND NOTES 2

DATE Nov. 2009
SUBMITTAL 60% Design
DESIGN Love / Shea
DRAWN Llanos
SHEET 27 of 31



Z 12 LOG VANES
Detail Plan

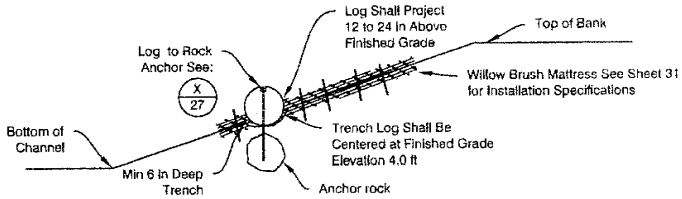
Log Vane Notes

Material Specifications

1. Contractor shall use large logs provided on site and salvaged during excavation at the direction of the Owner. Logs shall not be cut unless at the direction of the Owner.
2. Logs will be selected by Owner and log placement will be at the direction of the Owner.
3. Logs shall be 30-36 inches in diameter and a minimum of 20-25 feet in length.
4. Logs in each structure shall be of similar size.
5. Anchoring shall conform to Detail X for Log to Rock Anchor, Sheet 27 and Detail W Log to Log Anchor Sheet 27.
6. Anchor rocks shall be a minimum of 2000 lbs (1 ton RSP). Approximately 36,000 pounds of anchor weight shall be installed per Log Vane. Owner will determine total weight and weight per anchor after logs are selected for the structure.

Installation Specifications

1. The Contractor shall install log vanes to the line, grade and detail described in the Contract Documents.
2. Log Vane structure shall be approximately 35 feet long, and any overlap shall be a minimum of 5 feet.
3. Logs shall be installed in a minimum 6-inch deep trench centered at the location of the specified finished grade elevation. Logs shall project beyond finished grade a minimum of 24 inches and no more than 30 inches. Larger logs shall be installed in deeper trenches to obtain the specified projection beyond finished grade.
4. Logs shall be permanently anchored firmly in place at a minimum of two locations near the endpoints of each log using Log to Rock Anchoring. Logs shall be also anchored together using Log to Log Anchoring.



U 28 LOG VANE
Detail Cross Section (NTS)

PRELIMINARY
NOT FOR CONSTRUCTION

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Project Management: Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

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HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

DETAIL OF LOG VANES

DATE: Nov. 2009
SUBMITTAL: 60% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 28 of 31

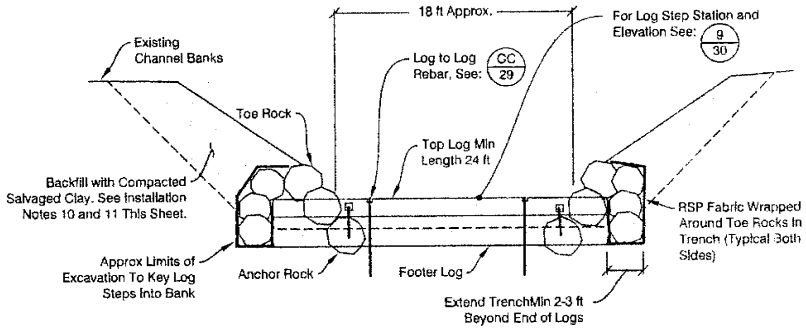
Log Step Pool Notes

Material Specifications

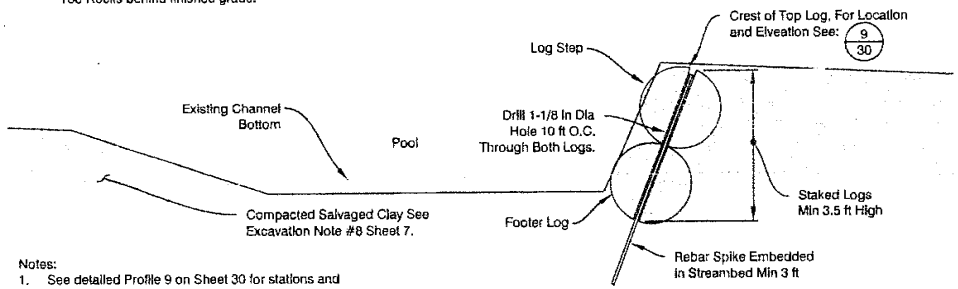
1. Contractor shall use large logs provided on site and salvaged during excavation at the direction of the Owner. Logs shall not be cut unless at the direction of the Owner.
2. Logs will be selected by Owner and log placement will be at the direction of the Owner.
3. Footer Logs and Top Logs shall be larger than 24 inches in diameter and a minimum of 24 feet in length. Top Logs shall consist of a single log.
4. Footer logs can consist of single logs or double logs or similar size with a minimum 2-foot lapped joint, with the permission of the Owner.
5. The lapped joint shall be anchored in accordance with Detail W for Log to Log Anchoring, Sheet 27. No more than three logs shall be used per Log Step Pool Structure.
6. Logs in each structure shall be of similar size.
7. Compacted Clay shall be salvaged from project excavation (See Excavation Note #6) Sheet 7.
8. Logs shall be connected together using Log to Log Rebaras shown on Typical Section BB this sheet.
9. Anchoring shall conform to Detail X for Log to Rock Anchor, Sheet 27.Rebar for Log to Log Rebar shall be 1-inch steel.
10. Anchor Rocks shall be a minimum of 2000 lbs (1 ton RSP).
11. Toe Rocks shall be a minimum of 1,000 lbs (1/2 ton RSP).
12. Approximately 18,000 pounds of anchor weight shall be installed per Log Step structure. Owner will determine total weight and weight per anchor after logs are selected for the structure.
13. RSP fabric shall be Type 2, nonwoven as specified in Caltrans, 2006 Section 88.

Installation Specifications

1. The Contractor shall install Log Step Pools to the line, grade and detail described in the Contract Documents.
2. Excavate trench in each streambank for Footer Log and Top Log installation. Trench shall extend 2-3 ft beyond ends of logs.
3. Footer logs shall be installed to the depth specified or lower to prevent scour of the structure. See typical CC this Sheet.
4. Top log shall be placed such that is shingled upstream and behind the crest of the footer log so that it cannot roll downstream.
5. Top Log shall be anchored firmly in place using Log to Rock Anchoring. Anchor Rocks shall be installed on both the upstream and downstream side of the structure such that the anchor rocks are approximately the same top elevation as the footer logs.
6. Toe Rock shall be stacked on top of the Anchor Rocks, Footer Log and Top Log. Rock shall be placed such that they project no more than 1-foot from finished grade. Rocks shall be stacked such that they cannot roll towards the stream. RSP fabric shall be wrapped around sides and bottom of Toe Rocks behind finished grade.
7. Log to log anchoring shall be with Log to Log Rebar as specified.
8. Clay installation shall conform to Excavation Note #8, Sheet 7..
9. Where clay is present under logs, clay will be installed and compacted prior to log installation
10. Stream bottom and trenches shall be backfilled and fully compacted with salvaged clay in accordance with Excavation Note #8, Sheet 7.
11. Bank slope shall be reconstructed to original bank slope, but not steeper than 1.5H:1V.

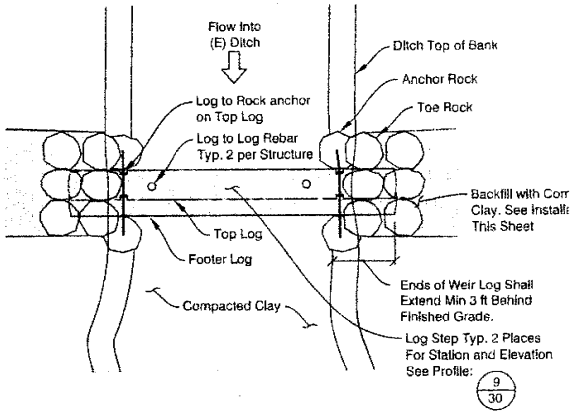


BB/12 LOG STEPS
Typical Section (NTS)



Notes:
1. See detailed Profile 9 on Sheet 30 for stations and elevations of all slope breaks.
2. Top Log shall be placed such that is shingled upstream and behind the crest of the Footer Log.
3. See Typical Section BB this sheet.

CC/12 LOG STEP
Typical Profile (NTS)



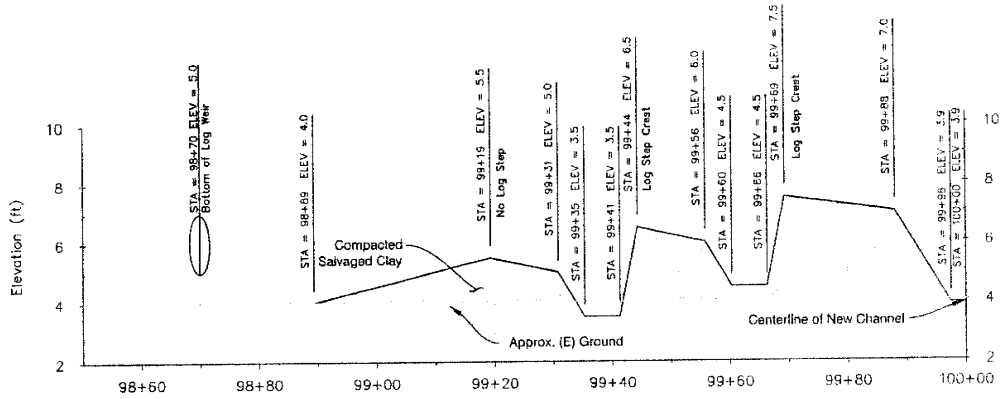
AA/12 LOG STEPS
Typical Plan (NTS)

Michael Love & Associates
Pacific Coast Fish, Wildlife and Wetlands Restoration Assoc.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2 Habitat Enhancement Project

LOG STEP POOL DETAILS AND NOTES

DATE Nov. 2009
SUBMITTAL 60% Design
DESIGN Love · Shea
DRAWN Llanos
SHEET 29 of 31



9/12 LOG STEPS
Detailed Profile - Vertical Exaggeration = 5:1

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HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

LOG STEP POOL
DETAILED PROFILE

DATE: Nov. 2009
SUBMITTAL: 60% Design
DESIGN: Love / Shea
DRAWN: Llanos
SHEET: 30 of 31

Planting Notes

Material Specifications

1. Live Willow Cuttings shall consist of live willow branches harvested on-site at the direction of the Owner.
2. Live willow cuttings shall be straight and no shorter than four feet in length and approximately ½ to 1 inch in diameter.
3. Brush Mattress shall be constructed of live willow stakes, live willow poles and live willow brush harvested on-site at the direction of the Owner.
4. All stakes shall be live willow stakes. Live willow stakes shall be approximately 1.5 to 3 inches in diameter and a minimum of 4 feet long.
5. Live willow poles shall be approximately 1.5 to 3 inches in diameter and 8 feet long.
6. Live willow brush shall be multiply branched no shorter than four feet in length and approximately ½ to 1 inch in diameter. Lengths of approximately 12 feet are preferable. Multiple branches shall be retained.
7. Harvested material shall be live and freshly cut. The plant material shall be free from disease and harmful insects. Basal ends shall be cut cleanly at an angle to facilitate easy insertion into the soil. The tops shall be cut square or blunt.
8. Plant materials shall not be stored greater than 48 hours after harvesting. Plant material shall be protected from drying by means of covering with canvas, burlap or straw and shall be kept moist.
9. Hemp or jute rope shall be used as tie-downs for the Brush Mattress.
10. Wattle shall consist of a 1-foot diameter manufactured coconut fiber log bound with coconut fiber netting.
11. Erosion Control Matting and permanent seeding shall be as specified in these contract documents, See Sheet 7.

Brush Mattress Notes

Installation Specifications

1. Brush Mattress slope stabilization shall be installed along the north channel bank as specified on Sheet 12.
2. Brush Mattress shall be installed in accordance with the California Salmonid Stream Habitat Restoration Manual Figure VII-59 (Flosi, et al., 1998) and as modified in these contract documents.
3. The disturbed bank shall be sloped and smoothed to ensure that all willows are in contact with the soil.
4. Drive live willow stakes in rows on three foot centers along the area of the bank that will be covered by the mattress. Live will stakes shall be driven into the ground a minimum of 3 feet. The tops of live stakes shall be trimmed to remove splits and crushed wood. Live stakes shall project a minimum of 1 foot above the finished mattress.
5. After the stakes have been placed, lay live willow brush on the bank with their butt ends facing downwards. Place approximately twenty to fifty pieces of brush per linear yard, depending on their diameter, to form a mattress. If the brush pieces are not long enough to cover the bank area, several layers shall be used, but it is necessary to lap, or "shingle," each added layer with the layer below it by at least eighteen inches. Mattress shall be approximately 6 inches thick.
6. Once the bank has been covered with a thick layer of willow brush, live willow poles shall be placed horizontally over the mattress at 3-foot spacing. These poles shall be placed against the live willow stakes and then tied to the stakes using rope.
7. Install rope tie downs in criss-cross patterns between the live stakes to fully anchor mattress.
8. Install wattle along bottom of brush matting at elevation 4.0 feet to fully cover the butt ends of the brush. Stake wattle on both sides at 4-foot intervals with live stakes. Wrap rope around stakes and over the top of the wattle to hold it firmly in place.
9. The entire mattress shall be lightly covered with earth or fine streambed material.
10. A live fascine or rock toe protection shall not be installed.

Willow Cutting Slope Stabilization Notes

Installation Specifications

1. Willow Cutting Slope Stabilization shall be installed along both channel banks as follows:
   a. Both banks Stations 44+00 and 49+00 between the bottom of bank and the limit of grading.
   b. Both banks Stations 26+00 to 44+00, between elevation 6.0 feet and the limit of grading, unless specified otherwise.
   c. Within the Trenching limits of the Log Step Pools and Log Jam.
2. Cuttings shall be installed through the soil stabilization matting, where installed, by cutting a small hole in the matting. Matting shall be installed where specified in the Erosion and Sediment Control Notes, Sheet 7.
3. Cuttings shall be installed 2 foot on-center, with approximately 1-foot of cutting extending beyond finished grade.
4. Cuttings shall be pushed into the bank or driven with equipment that minimizes crushing and splitting of the top of the cutting. The tops of the willow cuttings shall be trimmed as necessary to remove splits and crushed wood.
5. Cuttings shall project a minimum of 1 foot above finished grade.

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HUMBOLDT BAY NATIONAL WILDLIFE REFUGE
Salmon Creek Phase 2
Habitat Enhancement Project

PLANTING NOTES

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SUBMITTAL: 90% Design
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DRAWN: Llanos
SHEET: 31 of 31